US Army Corps
of Engineers
Walla Walla District

Evaluation Report of Structures for Deer Creek Dam

Prepared For:
Nez Perce Tribe

April 1999

20010321 069

AQM01-05-1043

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	April 1999	Final Report

4. TITLE AND SUBTITLE
Evaluation Report of Structures for Deer Creek Dam

5. FUNDING NUMBERS

6. AUTHOR(S)
Walla Walla District, Corps of Engineers

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Walla Walla District, Corps of Engineers
201 North Third Street
Walla Walla, WA 99362

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Nez Perce Tribe, Lapwai, Idaho

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The U.S. Army Corps of Engineers (Corps), Walla Walla District, by agreement with the Nez Perce Tribe (NPT), evaluated dam options for High Falls Reservoir Project (Deer Creek Dam) site. This work is part of the NPT Ponds Project, a fish stocking program to mitigate for anadromous fishery losses due to construction and operation of the Federal Columbia River Power System. The project site is located on Deer Creek in Lewis County, Idaho. The evaluation report develops a conceptual design for two dam options: homogeneous earthen embankment dam and roller compacted concrete dam (RCC).

The embankment dam option includes an upstream low-level intake structure, and overflow emergency spillway with a 150-foot long creast. The RCC structure incorporates an integral outlet structure and an integral, 150-foot wide emergency spillway.

Concept-level cost estimates show the total cost of the project ranges between 5.0 million to 6.3 million regardless of whethe the structure is an embankment dam or a roller compacted concrete dam. Both structures are configured for minimal maintenance, unattended operation, and ease of construction. Consequently the selection of the type of structure is not based on cost but should be based on other factors. Those factors include aesthetics, areal disturbance, operational and maintenanc requirements.

14. SUBJECT TERMS
Dams, Site evalution, Roller-Compacted concrete, Embankment, Spillway, Foundation, Hydrology, Feasibility Study, Access Road

15. NUMBER OF PAGES
148

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

EVALUATION REPORT OF STRUCTURES FOR DEER CREEK DAM

Prepared for the Nez Perce Tribe

April 1999

EVALUATION REPORT OF STRUCTURES
FOR DEER CREEK DAM

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EVALUATION REPORT OF STRUCTURES
FOR DEER CREEK DAM

EXECUTIVE SUMMARY

BACKGROUND.

The U.S. Army Corps of Engineers (Corps), Walla Walla District, by agreement with the Nez Perce Tribe (NPT), evaluated dam options for the Deer Creek Dam and High Falls Reservoir Project (Deer Creek Project) site. The Deer Creek Project site is located on Deer Creek in Lewis County, Idaho, and extends across sec. 18, 20, and 28, T. 32 N., R. 3 W., Boise Meridian. It is located on lands owned by the NPT in the heart of the Nez Perce National Forest. The site is approximately 12 miles west of Winchester, Idaho.

This work was funded on a cost-shared basis under the Corps' Planning Assistance to States and Tribes Program.

The purpose of this evaluation report is to identify and conceptualize features of the Deer Creek Project. The project features include access to the Deer Creek Project site, development of construction materials, and construction of the dam and appurtenant structures. This evaluation report is prepared at a reconnaissance level. It does not provide for design of the specific project features. Instead it identifies the options considered for selection and provides a clear development of the concept. The evaluation report develops a conceptual design for two dam options: homogenous earthen embankment dam and roller compacted concrete (RCC) dam.

DAM OPTIONS.

Embankment Dam Option. The embankment dam requires about 5 feet (ft) of freeboard for wave action and settlement and an additional 5 to 6 ft for discharge head over the emergency spillway. A low-level intake structure would be constructed upstream of the dam with a concrete pipe delivering water downstream through the dam and back into Deer Creek through an outlet structure. Should selective level withdrawal be required, a tower would be constructed at the intake. An overflow emergency spillway with a 150-foot crest length is proposed. The spillway could be constructed on the left abutment where a natural saddle would allow for an overland flow of water away from the embankment and back into Deer Creek downstream of the dam.

The RCC Dam Option. The RCC structure would incorporate an outlet system attached or embedded in the structure that incorporates a low-level gated inlet, a selective withdrawal system, and a self-regulating water surface "skimmer." The 150-foot-wide emergency spillway would be incorporated into the structure with spill over the top of the dam directly into Deer Creek downstream of the dam.

Both options were developed to meet the requirements of the NPT Ponds Project. The NPT Ponds Project is a fish stocking program to mitigate for anadromous fishery losses due to construction and operation of the Federal Columbia River Power System (FCRPS).

RECOMMENDATIONS.

Concept-level cost estimates show the total cost of the project ranges between \$5.0 million to \$6.3 million regardless of whether the structure is an embankment dam or an RCC dam.

Both structures are configured for minimal maintenance, unattended operation, and ease of construction. Consequently, the selection of the type of structure is not based on cost but should be based on other factors. Those factors include aesthetics, area disturbance, and operational and maintenance requirements.

A detailed design of the dam must include additional explorations to identify the unexplored rock intrusion in the foundation and to better characterize materials forming the spillway and the extremities of the dam structure.

EVALUATION REPORT OF STRUCTURES FOR DEER CREEK DAM

SECTION 1.0 - INTRODUCTION

1.01. GENERAL.

The Deer Creek Dam and High Falls Reservoir Project (Deer Creek Project) site is located on Deer Creek in Lewis County, Idaho, and extends across sec. 18, 20, and 28, T. 32 N., R. 3 W., Boise Meridian. It is located on lands owned by the Nez Perce Tribe (NPT) in the heart of the Nez Perce National Forest. The site is approximately 12 miles west of Winchester, Idaho.

The U.S. Army Corps of Engineers (Corps), Walla Walla District, by agreement with the NPT is performing an evaluation of dam options for the Deer Creek Project site. This work was funded on a cost-shared basis under the Corps' Planning Assistance to States and Tribes Program. This program was authorized by Congress in Section 22 of the Water Resources Development Act of 1974 (Public Law 93-251) as amended, and it authorizes the Corps to cost share with states and Tribes on a 50/50 basis for planning and conceptual design efforts to support comprehensive water plans. The Walla Walla District and the Nez Perce tribe entered into a cost-sharing agreement on June 8, 1998. The original scope of work included both the Deer Creek site and the Cold Springs site. Due to real estate issues, the NPT directed the Corps to discontinue efforts on the Cold Springs site.

The scope of the Walla Walla District work was to provide a concept-level design of viable dam options resulting in a recommended project configuration. In addition, a cost estimate is included from which to base future budget planning for the Deer Creek Project.

Site mapping and foundation and materials explorations for the Deer Creek Project were performed under separate agreements with Wyatt Engineering of Lewiston, Idaho, and GeoEngineers, Inc., of Spokane, Washington, respectively. The Corps provided assistance to the NPT in determining the scope of explorations work.

1.02. SCOPE OF THE EVALUATION REPORT.

The purpose of this evaluation report is to identify and conceptualize all the features of the Deer Creek Project. The project features include access to the Deer Creek Project site, development of construction materials, and construction of the dam and appurtenant structures. This evaluation report is prepared at a reconnaissance level. It does not provide for design of the project features. Instead, it identifies the options considered for selection and provides a clear development of the concept.

Several factors contributed to the selection and development of options upon which the construction cost estimate is based. The first factor is that experienced engineers performed several site visits. As a result of this activity and individual experience, the engineering elements of the Deer Creek Project were developed. The second factor is that information was developed that was critical to evaluating the foundation conditions and the nature and composition of site materials. The foundation and material explorations were performed by contract on behalf of the NPT. The third factor is that the Corps' experience in similar work was a basis for developing design features, construction quantities, and eventually a cost estimate.

This evaluation report documents the evaluation of two general types of dams: homogenous earthfill embankment and roller compacted concrete (RCC). Both are gravity dams constructed predominately with on-site materials and designed for operation under full and constant pool conditions. A conceptual development of all major design features of these dams is provided and a detailed breakdown of associated costs.

This evaluation report does not contain several elements normally considered part of a feasibility study. This evaluation report does not address environmental, economic, social, or cultural issues nor does it provide an incremental analysis of project costs and benefits. This evaluation report will become part of an NPT proposal for enhancement of resident fish mitigation programs.

1.03. BACKGROUND INFORMATION.

The Northwest Power Act (Act) empowers and requires the Northwest Power Planning Council (NPPC) to include measures in its Columbia River Basin Fish and Wildlife Program (Program) to address system-wide fish and wildlife losses resulting from construction and operation of hydropower dams. The Act further states that the NPPC may include in its Program measures that provide off-site mitigation (mitigation physically removed from the hydro-projects that caused the need to mitigate). The Program includes a goal "to recover and preserve the health of native resident fish injured by the hydropower system, where feasible and appropriate, to use resident fish to mitigate for anadromous fish loses in the system." The NPPC receives and reviews proposals to mitigate for fish and wildlife losses and refers approved measures to the Bonneville Power Administration (BPA) for funding.

Among measures recommended by the NPPC for off-site mitigation is the Nez Perce Trout Ponds Project. The Nez Perce Project is authorized under Sections 10.8D.2 of the NPPC's September 13, 1995, *Resident Fish and Wildlife Amendments to the Program*. Section 10.8D.1 authorizes the BPA to fund the NPT to implement resident fish substitution actions in the blocked area above Dworshak Dam to mitigate for losses of anadromous fish.

There are presently two NPT-use trout ponds within the NPT Indian Reservation: Talmaks with a surface area of about 4.0 acres; and Mud Springs, with a surface area of about 7.4 acres. By 2001, the NPT hopes to have constructed 10 additional impoundments for fish stocking. When all 12 impoundments are stocked, the combined annual harvest should be 10,500 pounds (lbs)of rainbow trout.

This evaluation report addresses 1 of the 10 additional fish impoundment projects. It focuses on the preliminary design and an impact analysis for the Deer Creek Project. The Deer Creek Project includes a dam that provides a reservoir of approximately 111 acres and a surface elevation 4,360 feet (ft) North American Vertical Datum (NAVD[1]). This Deer Creek Project on the headwaters of Deer Creek (a tributary of the Salmon River) will create the High Falls Reservoir.

Following construction, the new fish pond will be incorporated into the fish stocking and monitoring programs. During subsequent years, beyond fiscal year 2006, there will be a persistent need for routine operation and maintenance, fish stocking, and environmental monitoring.

The Environment Assessment is being prepared by the BPA and the NPT to assess the environmental effects of the proposed Deer Creek Project.

1.04. PROJECT CRITERIA.

The dam options considered for the Deer Creek Dam Project will be a straight-axis gravity dam structure approximately 600 ft long at the top of the dam. The dam structure will be 80 ft high measured from the deepest point in the foundation. The hydraulic head is 70 ft measured from the assumed invert elevation of the streambed. The structures include an embedded 48-inch conduit that originates with a low-level outlet located upstream from the dam and terminates at an impact basin energy dissipater located downstream from the dam. An ungated, overflow spillway is sized to discharge a flow equal to one-half of the probable maximum flood of 5,800 cubic feet per second (cfs). Because of real estate constraints, the normal operating pool is fixed at elevation 4,360 ft. The overflow spillway crest regulates the pool elevation, and the low-level outlet is for infrequent reservoir drawdown required for inspection, maintenance, or emergency situations.

Numerous options are available for design of these structures and offer a wide range of cost and performance. It is crucial to match the project functional requirements with the most advantageous project option. The following considerations were evaluated to select the appropriate design features for an RCC dam: Unmanned operation, lowered-complexity of construction, relatively impermeable structure, and minimized project construction and operating cost.

Since a permanent operating staff would not be a resident at the project, it was determined that the Dam Creek Dam Project should operate with minimal

[1] All elevations in this report are based on the NAVD,1988, unless otherwise specified.

staffing requirements. The reservoir water surface needs to be self-regulating. This requires that an overflow structure be provided at the desired water surface elevation and overflow water returned to the stream.

In order to secure as low a price as possible for construction, the design features and subsequent construction requirements should be appropriate for regional contractors. Selected design elements should use as many standard construction features as possible and include provisions to compensate for marginal construction conditions. Since the Deer Creek Project site is in a remote location, less complex operations usually require less mobilization of specialized equipment.

The Deer Creek stream flows are very low to nonexistent during the late summer months. Maximum normal spring flow (50 percent exceedance flow) is calculated to be 60 cfs during April and May. In order to maintain a full reservoir, it is critical that the structure and the foundation be relatively impervious. Measures to assure such performance are included in the proposed designs.

As is the case with many projects, costs must be at an absolute minimum. Proposed options are considered "no frills" and were selected, in part, because of their low cost.

SECTION 2.0 - HYDROLOGY

2.01. GENERAL.

The purpose of this section is to present the Deer Creek basin hydrology for the proposed Deer Creek Project. The following subjects will be addressed in this section: basin description, climate, stream flow information, flood frequencies, probable maximum flood, spillway design flood, drawdown capability, sedimentation, flood control, and dam break analysis.

2.02. BASIN DESCRIPTION.

The Deer Creek basin is located in the Salmon River basin and in Northwest Idaho. It has a length of 7.2 miles and an average stream slope of 120 ft per mile. The Deer Creek basin is roughly rectangular in shape, approximately 7 miles long and 4 miles wide. The drainage basin area at the Deer Creek Project is approximately 25.1 square miles. The stream flows from north to south. Approximately 70 percent of the basin is forested. The Deer Creek basin map is located in appendix C, map 2.

2.03. CLIMATE.

a. General.

The area has a temperate climate with moderate precipitation, cool moist winters, and warm summers. Mean annual temperatures characteristic of the area are approximately 45 degrees Fahrenheit. The average annual precipitation for the area is approximately 25 inches. Storms are not usually severe, but the area is subject to general storms and occasional thunderstorms. The storms most significant to stream flow are those that occur as general rainstorms on snow-covered frozen ground. Thunderstorms usually occur from late spring through the summer, seldom lasting more that a few minutes, and seldom cover large areas. Precipitation records are too sparse to show intensities received, but surrounding areas have a history of occasional flash floods from thunderstorms. Table 2-3 lists a summary of climatological data representative of Deer Creek. All climatological data summarized on table 2-3 was provided by the Idaho State Climatologist.

b. Precipitation.

The Deer Creek basin precipitation characteristics affect the basin's water supply, stream flows, and flood characteristics. The mean annual precipitation at nearby Winchester, Idaho, is approximately 24.2 inches per year and varies from 17 to 32 inches annually. A large portion of the precipitation during the winter months falls as snow. Table 2-1 lists precipitation and snow data for four nearby stations. These stations are shown on map 1 (appendix C).

c. Temperature.

Observed extremes in the locality have been -40 degrees Fahrenheit and 106 degrees Fahrenheit. Summer average temperatures range from 60 to 66 degrees Fahrenheit while winter average temperatures range from 27 to 33 degrees Fahrenheit.

2.04. STREAMS.

Deer Creek flows in a southerly direction. The Deer Creek basin elevation, at its headwaters, is above 5,100 ft National Geodetic Vertical Datum (NGVD) 1929 to an elevation at the Deer Creek Project site of approximately 4,290 ft NGVD.

2.05. DISCHARGE RECORDS.

Mean daily discharge records are available at the U.S. Geological Survey (USGS) gaging station as shown on map 2 (appendix C). The drainage area at this gaging station, located in the upper portion of the drainage, is approximately 19.1 square miles. This gaging station (Deer Creek near Winchester, Idaho, USGS station number 13317500) recorded daily discharges only for the period October 1, 1952, through November 30, 1956. The maximum discharge recorded at this gaging station was 209 cfs on April 16, 1956. There are two additional USGS gaging stations in the basin. These are Johns Creek near Grangeville, Idaho, and North Fork Skookumchuck Creek near White Bird, Idaho. These gaging stations have record periods of 1961 through 1972 and 1960 through 1971, respectively.

2.06. STREAM FLOW.

Daily stream flow records are available for Deer Creek for the period listed above in discharge records. For Deer Creek, the high flows for the year normally occur during the spring months and are caused by snowmelt. Lowest flows occur in the late summer and fall months. Large floods on Deer Creek usually result from general rainstorms or general rainstorm plus snowmelt. These floods may occur during the winter or the spring months. The area also has a potential for thunderstorm floods. A flow duration curve for April 1 through July 31 for the period of record is shown on chart 11 (appendix D).

2.07. CHANNEL CAPACITIES.

The channel below the dam flows through a steep canyon. This canyon will easily contain flows up to 11,600 cfs probable maximum flow (PMF).

2.08. TYPES OF FLOODS.

A combination of rain and snowmelt on frozen ground have produced the largest historical floods on Deer Creek. The records for Johns Creek near Grangeville, Idaho, and North Fork Skookumchuck Creek near White Bird, Idaho, do not indicate any major

thunderstorm activity in the area. Thunderstorm floods have produced relatively minor discharges.

2.09. UNIT HYDROGRAPHS AND FLOOD ROUTING.

Unit hydrographs were developed for six sub-basins of the Deer Creek drainage basin. The basin was so divided because the six tributaries run in opposing directions making a single basin length or centroid unrepresentative of the entire basin. The six sub-basins are West Fork Deer Creek, Larabee Meadows, Upper Deer Creek, Swamp Creek, Lower Deer Creek, and Rail Road Grade. These sub-basins are shown on map 2 (appendix C). Unit hydrographs were derived from Snyder's Synthetic Unit Hydrograph relations, reference Engineer Manual (EM) 1110-2-1417. Unit hydrographs and applicable parameters are shown on charts 2 through 7 (appendix D), respectively.

2.10. FLOOD HYDROGRAPHS.

Specific Flood Frequency Hydrographs were developed using the unit hydrographs shown on charts 2 through 7 (appendix D). The excess rates were the same used as for the Cold Spring Creek Drainage and precipitation from the National Oceanographic and Atmospheric Administration (NOAA) Atlas 2, *Precipitation-Frequency Atlas of the Western United States*, Idaho, 1973. Precipitation was arrayed as shown in figure 6-1(b) of the Hydrometeorological Report (HMR) 43.

Specific frequency point precipitation taken from the NOAA Atlas referenced above is shown in table 2-1.

Table 2-1. Specific Frequency Point Precipitation.

Recurrence Interval (years)	6 Hour (inches)	24 Hour (inches)
2	0.87	1.56
5	1.10	1.94
10	1.30	2.19
25	1.56	2.57
50	1.74	2.90
100	1.84	3.20

Excess rates were calibrated as described for Cold Spring Creek, a nearby drainage basin. Excess rates were applied to specific frequency precipitation and associated peak discharges were found by varying excess rates and matching expected probability discharges (see table 2-2).

Table 2-2. Excess Rate for Specific Frequency Floods.

Recurrence Interval (years)	Excess Rate (percent)
2	5.4
5	9.4
10	12.8
25	17.1
50	21.6
100	26.5
200	32.2
500	40.9

The Hydrologic Engineering Center Model HEC-1, Flood Hydrograph Package, dated 1998, was used to route sub-basin flows and determine specific frequency hydrographs and peak discharges. The annual peak discharge frequency curve shown on chart 1 (appendix D) was computed by fitting a Log Pearson Type III Curve through the specific frequency discharges for the above recurrence intervals.

2.11. PROBABLE MAXIMUM FLOOD.

The PMF estimate represents flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

The probable maximum precipitation, used for determining this flood, was developed using procedures outlined in HMR 43. The critical month was determined to be December, and the total probable maximum precipitation determined was 16.05 inches (8.50 inches of precipitation and 7.55 inches of snow melt). The precipitation was arrayed as shown in figure 6-1 (b) of HMR 43.

Losses were estimated to be initially one-tenth of an inch and 0.03 inches per hour thereafter. Arrayed probable maximum precipitation and excesses are shown on charts 8 (appendix D) and show inflow and outflow hydrographs for the RCC and embankment dam options.

The Hydrologic Engineering Center Model HEC-1, Flood Hydrograph Package, 1990, was used to determine the PMF hydrograph shown on chart 8 (appendix D).

In the case of this dam, one-half the PMF may be used for spillway design as outlined in the *National Program for Inspection of Non-Federal Dams*, Engineer Regulation (ER) 1110-2-106.

2.12. SPILLWAY DESIGN.

The spillway was designed using one-half the PMF peak discharge, 5,800 cfs. One-half the PMF was routed through the reservoir using an HEC-1 model. With the spillway crest at elevation 4,360 ft, the maximum pool elevation or surcharge for a 150-foot-wide spillway is approximately 4.3 ft and for a 100-foot-wide spillway 5.8 ft. The volume of one-half the PMF is large enough that starting water surface does not impact the final surcharge and peak flow for the spillway design flood.

2.13. WIND WAVE ANALYSIS.

Given the maximum fetch length of less than 1 mile, and the maximum wind speed of approximately 50 miles per hour from the PMF hydrometeorologic conditions, a maximum wave height of 3 ft was determined giving a maximum pool elevation 4,367.3 and 4,368.8 ft for the embankment and RCC dams, respectively. The maximum wave height was computed using Engineer Technical Letter Number 1110-2-305, *Determining Sheltered Water and Wave Characteristics.*

2.14. DRAWDOWN CAPABILITY.

The Deer Creek Project will be equipped with a low-level outlet that would be capable of drawing the reservoir down from elevation 4,360 ft to 4,333.2 ft in a period of approximately 30 days. The drawdown curve and referenced notes are shown on chart 10 (appendix D).

2.15. FLOOD CONTROL.

Flood Control was not evaluated.

2.16. SEDIMENTATION.

An estimated 400 acre-feet of sediment would accumulate in a 100-year time period. This estimate was made using engineering judgement. This volume corresponds to an elevation of approximately 4,329 ft. See the storage-elevation curve on chart 9 (appendix D).

2.17. DAM BREAK MODEL.

A dam break model was developed for the Deer Creek Project using the National Weather Service Dam Break Model, dated 1991. This model showed that a flood wave with a peak discharge of approximately 243,000 cfs would result from a near instantaneous dam failure. This flood wave was routed to the mouth of the Salmon River, approximately 20 miles downstream of the proposed Deer Creek Project site. Cross sections, graphs of stage, and discharge versus time are shown on charts 12 through 14 (appendix D). These represent the results of the dam break model at the Deer Creek Project, at the mouth of Deer Creek and at the mouth of the Salmon

River, respectively. A dam break flood inundation map is shown on map 3 (appendix C). Prior to constructing the project, the flood routing should continue down the Snake River until the flood hydrograph has been attentuated to a safe level.

2.18. TAILWATER RATING CURVE.

A tailwater rating curve was developed for a location at the toe of the proposed RCC dam. This rating curve is shown on chart 15 (appendix D).

Table 2-3. Climatological Data.

TEMPERATURE, DEGREES FAHRENHEIT

Extreme Temperatures	Elevation ft	Maximum	Date	Minimum	Date	Period of Record
Cottonwood 2 WSW[1/]	3945	98	14 AUG 94	-20	03 FEB 89	FEB 50 - NOV 97
Grangeville	3360	106	04 AUG 61	-25	30 DEC 68	AUG 48 - NOV 97
Nez Perce	3145	104	04 AUG 61	-33	30 DEC 68	DEC 01 - OCT 96
Winchester 1 ESE[2/]	3960	98	23 AUG 69	-40	30 DEC 68	JUL 65 - NOV 97

[1/] West southwest.
[2/] East southeast.

Average Monthly Temperatures	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Cottonwood 2 WSW	29	33	39	45	51	59	62	59	52	46	35	29
Grangeville	28	33	37	44	52	58	66	66	57	47	36	31
Nez Perce	28	33	37	44	51	58	65	65	57	47	35	29
Winchester 1 ESE	27	31	35	41	48	55	61	61	53	44	34	27

PRECIPITATION, INCHES

Record Precipitation	Elevation ft	Maximum 24-Hour	Date	Period of Record
Cottonwood 2 WSW	3945	2.10	23 JAN 82	FEB 50 - NOV 97
Grangeville	3360	3.01	14 SEP 55	AUG 48 - NOV 97
Nez Perce	3145	2.30	13 JUL 56	DEC 01 - OCT 96
Winchester 1 ESE	3960	2.12	15 AUG 93	JUL 65 - NOV 97

Average Monthly Precipitation	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Cottonwood 2 WSW	1.74	1.53	1.65	2.28	3.24	2.42	1.45	1.18	1.21	1.35	2.13	1.73
Grangeville	1.47	1.39	2.16	2.71	3.36	2.98	1.08	1.05	1.71	2.04	1.87	1.64
Nez Perce	1.71	1.33	1.79	2.22	2.91	2.31	1.13	1.21	1.33	1.69	1.92	1.64
Winchester 1 ESE	2.17	1.67	2.51	2.79	2.95	2.19	1.36	1.31	1.45	1.88	2.41	1.99

SNOW, INCHES

Record Snowfall	Elevation ft	Maximum 24-Hour	Date	Period of Record
Cottonwood 2 WSW	3945	12	18 NOV 96	FEB 50 - NOV 97
Grangeville	3360	21	25 NOV 61	AUG 48 - NOV 97
Nez Perce	3145	13	14 FEB 66	DEC 01 - OCT 96
Winchester 1 ESE	3960	20	14 FEB 66	JUL 65 - NOV 97

SECTION 3.0 - GEOLOGY

3.01. GENERAL.

This section contains findings from the preliminary foundation investigations at Deer Creek Project site located on the NPT Indian Reservation in Lewis County, Idaho.

The NPT contracted GeoEngineers, Inc., to perform explorations at the site. The Corps defined the scope of explorations to be performed. Exploration data is compiled in a report prepared by GeoEngineers, Inc., *Geotechnical Exploration and Testing Proposed Deer Creek Reservoir, Lewis County, Idaho,* January 8, 1999. Four core holes were drilled approximately along the proposed dam alignment: two holes in the valley floor and one hole in each abutment. All of these holes were water pressure tested to evaluate foundation permeability. Additionally, one core hole was drilled at a potential on-site quarry location. Over a portion of the proposed reservoir area, 13 test pits were excavated. Laboratory physical properties testing was performed on test pit samples and petrographic analysis performed on various core samples.

3.02. SITE GEOLOGY.

a. Topography.

The proposed Deer Creek Project is located within a north to northwest trending valley containing Deer Creek. The valley floor ranges from 200 to 600 ft wide. The valley floor is 200 ft wide at the proposed Deer Creek Project. The slopes forming both the right and left abutments are about 3 horizontal (H) to 1 vertical (V), and the left abutment flattens out into a bench about elevation 4,370 ft. Slopes forming the valley sides are, in general, about 3H to 1V; however, in some local locations where rock crops out ,slopes steepen to almost vertical.

b. Geology.

Three rock types of the Permian – Late Triassic Seven Devils Volcanics were mapped at the proposed Deer Creek Project site. The predominate rock type is an altered andesite. The andesite is intruded by a quartz diorite and, apparently, the andesite has been altered to an andesite cataclasite. Regardless, the contact between the andesite and quartz diorite is interpreted to be intrusive, while the cataclasite may be in fault contact with the andesite. Contacts with these three units underlay and run perpendicular to the proposed dam alignment. The rock in outcrop is moderately weathered on the surface and fresh and hard when broken. Bedrock outcrops, while few in number, appear to be mostly massive, in general, and are not indicative of the close-space fracturing found in the core holes.

c. Foundation Conditions.

Four core holes were drilled along the proposed dam alignment. Bedrock is encountered at depths of 4 to 9 ft on the valley floor and 0.5 to 3.5 ft in the slopes of the abutments. Core recovery was very good. The rock is generally fresh to slightly weathered and hard. The core is moderate to intensely fractured with fracture spacing close to moderate. Most fractures are tight but show evidence of water movement. Both core holes drilled in the abutments leaked during drilling, indicating high hydraulic conductivity through the abutments. All the core holes were water tested as they were advanced. At the base of and on the right abutment (RA), holes RA-1 and RA-2 showed high hydraulic conductivity to 80 ft in depth. At the base of and on the left abutment (LA) holes LA-3 and LA-4 showed a low hydraulic conductivity.

d. Reservoir Conditions.

Very little rock crops out in the proposed reservoir area. A weathered bedrock surface was encountered in most of the test pits and varied in depth from 4 to 8 ft below ground surface. Test pits were excavated with a backhoe to a depth of 4 to 10.5 ft with the majority about 9 ft deep. The soil mantle over the reservoir basin is silt and clay rich indicating low permeability.

e. Quarry Site.

One core hole was drilled to a depth of 80 ft at the proposed quarry location. The hole was cored on the down slope edge of the road and bedrock was encountered at 11 ft. The bedrock is fresh, hard, altered andesite. The rock is intensely fractured to a depth of 27 ft. The remainder of the hole is moderately fractured with fracture spacing of about 1 foot and a rock quality designation (RQD) of 80 to 100 percent. The hole was collared at the road edge at about elevation 4,324 ft, making the top of the bedrock at about elevation 4,313 ft, and moderately fractured rock at about elevation 4,297 ft. The valley floor is at about elevation 4,290 ft. The depth to bedrock of 11 ft at this location may be due to the hole being located on the outer edge of the road. The depth to bedrock may be only 4 or 5 ft if measured perpendicular to the slope below the road cut. From interpreting the core log and the topography at the core hole location, it appears that rock suitable for crushing or random rock fill is about 6 ft from the slope surface. At a depth of about 15 ft, rock of 8- to 24-inch size suitable for riprap would be encountered. Trenching on this slope would better define the depths to rock.

f. Ground Water.

No water level measurements were made in any of the core holes. Ground water was encountered and measured in test pits (TP) 1, TP-5, TP-8, TP-10, and TP-11. The test pits were excavated in September 1998 and the ground water level appears to be about 5 ft below the valley floor.

3.03. ENGINEERING CONSIDERATIONS.

a. General.

There is 0 to 9 ft of sand and gravel overburden along the proposed dam alignment. Stripping this material for the proposed structures would amount to common excavation of about 5,000 cubic yards (cy) of sand and gravel.

Core drilling indicated a fresh hard rock foundation that is intensely fractured. Fracture intensity decreases with depth. The bedrock foundation is mostly altered andesite with a minor portion being quartz diorite. Both of these rock types are strong, durable, and virtually incompressible in regards to the considered structures.

Cleaning the foundation to a depth that fracturing is reduced would be impractical. Where concrete structures will be constructed or impermeable fill placed, overburden should be removed (5,000 cy), and the foundation rock should be cleaned of all general lose materials to a depth of 1 to 2 ft, if necessary. Rock removal would amount to about 2,000 cy of material. Hard competent interlocked rock should not be removed. Overhung or vertical rock should be laid back to allow for earth embankment or RCC placement. In general, the maximum steepness in cut slopes in rock should be .25H to 1V and 1.5H to 1V in soil.

Excavations in the valley floor deeper than about 5 ft may require dewatering.

b. Foundation Grouting.

Due to the low annual flow in Deer Creek, water loss through foundation seepage cannot be tolerated. Due to the high hydraulic conductivity through the closely spaced open fractures in most of the foundation bedrock, a grout curtain will be required. Prior to final foundation cleaning, a single row grout curtain should be constructed in the dam foundation regardless of type of dam structure. Primary grout holes should be spaced at 40 ft, and it should be expected that the final closure holes could be down to a 5-foot spacing. The total depth of the grout holes should be no deeper than the total head expected in the reservoir. Therefore, for the 80-foot-high dam, grout holes would be approximately 80 ft deep.

c. Embankment Dam Option.

(1) Abutments and Foundation.

The overburden should be removed and the rock surface cleaned where the impermeable core of the dam will contact the foundation. The limits of excavation and cleaning are as stated above. A single row grout curtain should be constructed prior to final cleaning, as outlined above. Any shear area or open joints or fractures located within the zone under the impermeable core section of the

embankment should be identified. These areas should be cleaned then sealed off at the surface using a dental or surface grouting technique.

(2) Spillway.

The emergency spillway should be placed in the left abutment near the left end of the embankment dam. The natural topography on the left abutment levels off into a slight bench and saddle near elevation 4,370 ft allowing a reasonably easy excavation for an emergency spillway. The saddle would naturally direct water away from the embankment. The cut for spillway excavation could be started at about elevation 4,360 ft and extend in a northeast direction upstream from the alignment. The material excavated would be mostly bedrock. The depth of excavation at the back of the cut would be 12 ft with the rock back slope laid back at .25H to 1V. The soil mantle, if any, should be laid back at 1.5H to 1V. The excavation would remove approximately 8,500 cy of material. The excavation should be mostly common. However, without further exploration, assume for estimating purposes, 50 percent of the material will be removed by drill and blast.

The flows expected over the 150-foot-wide emergency spillway are expected to be of short duration and relatively low velocity. Given that the rock in general is fresh, hard, and intensely to moderately fractured, a concrete lined channel should not be necessary. However, the rock is fractured and erosion in the form of plucking could be a problem. Trenching in this area would better define the quality of the rock surface. To protect the rock downstream of the spillway from immediate erosion in a spill event, a 2-foot-thick sacrificial random fill could be placed over the bedrock 40 to 50 ft downstream.

d. The RCC Dam Option.

(1) Abutments and Foundation.

Overburden should be removed over the entire footprint of the dam structure. A single line, grout curtain should be constructed and the foundation cleaned, as described above.

(2) Spillway.

As much as 5,800 cfs could be released over the spillway. Again, the rock is hard and competent, but the fracturing may make it susceptible to plucking and headward erosion. Trenching in this area would better define the quality of the rock surface. Some type of stilling basin may be required to protect the foundation.

3.04. FURTHER INVESTIGATIONS.

To better define construction quantities and the dam foundation, additional subsurface exploration should be performed.

Two additional core holes should be drilled along the dam alignment. One should be placed higher on the left abutment in the vicinity of the proposed emergency spillway. The other hole should be an angled hole in the valley floor to explore the nature of the contacts between the quartz diorite, altered andesite, and the cataclasite.

Backhoe trenching should be performed in the vicinity of the proposed quarry, emergency spillway, and stream channel spill basin to determine depth to bedrock, surface rock quality, and depth of common excavation.

Values for hydraulic conductivity should be computed using the water test data.

3.05. CONCLUSIONS.

The rock foundation appears competent for either an embankment or RCC structure. A single row grout curtain is required to avoid seepage losses through the foundation and abutment fractures. The left abutment's topography is ideal for a natural emergency spillway.

SECTION 4.0 - SITE WORK ISSUES

4.01. GENERAL.

This section presents design criteria, design parameters, assumptions, and methods that will be used in preparing the civil design of the access roads for the Deer Creek Project.

4.02. DESIGN CRITERIA.

All design will be based on existing design parameters outlined in the following references and, in general, will conform to the following EM's, design manuals, and accepted engineering practices:

a. EM 1110-2-410, *Design of Recreation Areas and Facilities - Access and Circulation*, December 31, 1982.

b. American Association of State Highway Transportation Officials, *Policy on Geometric Design of Highways and Streets*, 1984

c. U.S. Department of Transportation, *Manual on Uniform Control Devices*, 1988.

4.03. ROAD DESIGN.

a. Design Parameters.

Access will be designed for a truck/tractor/semitrailer combination (WB-40) that is representative of the majority of medium to large truck/tractor/semitrailer combinations that will be used for hauling material. It is not anticipated that vehicular parking will be required for the new facility at this time.

b. Access Requirements.

Access for construction is needed to the reservoir, the left abutment, and the right abutment. Permanent access, after the reservoir is filled, is needed to the left abutment. Access to the right abutment of the dam will be by crossing the dam. A section of the reservoir access road will remain available permanently for reservoir access and boat launching.

c. Existing Conditions.

The existing unpaved roads are impassible during wet weather. One of the keys to constructing this dam and using the reservoir is to make it accessible for both

construction vehicles and common light traffic. The existing roads are not considered usable in the current condition.

d. Improved Roads.

The existing roads must be leveled, graded, and compacted. Approximately 4 inches of base material with 2 inches of top course material to be placed and compacted is needed to upgrade the road section. This should provide an adequate foundation for vehicles to access the dam site. A single-lane road with turnouts every 2,000 ft is suggested. Plate 3 (appendix B) shows the locations of roads needed to be improved and new road sections that will be needed to connect them. By using existing roadway alignments and maintaining the single lane configuration, environmental damage in the area is minimized. However, as shown on plate 3, some construction roads will need to be two lanes to accommodate construction traffic.

4.04. STORM DRAINAGE.

In general, road grades will provide for surface runoff. An estimate of six culverts will be needed along the access roads. More hydraulic information will be needed to perform a complete design of the culverts needed along the road.

4.05. SIGNING.

Roadways will have directional symbols to guide traffic. Signs will be posted, as appropriate, for identification, safety, and provision of operating instructions.

4.06. SECURITY.

A limited access gate will be provided for the left abutment to restrict unwanted vehicular traffic. Pedestrian traffic will be allowed to cross the dam during normal spillway flows.

4.07. BORROW AREA.

Borrow materials can be obtained from a potential quarry approximately 1 mile from the dam site. This site has been used for minor rock materials for culvert repair. It is anticipated that adequate quantity and quality of rock is available.

4.08. CONCLUSIONS.

The prime factors in designing the roads were having adequate access to the site, environmental preservation, and cost. Costs were reduced by using only 6 inches of material for base and top course, using one-lane roads with turnouts, using existing roads/paths as much as possible, and finding the most direct access possible. By using the existing dirt roads whenever possible, environmental effects were

minimized. Some new sections of road will be needed for the Deer Creek Project road.

SECTION 5.0 - HYDRAULIC STRUCTURES

5.01. GENERAL.

The hydraulic structures for the Deer Creek Project consist of a spillway for each type of alternative structure. The embankment dam utilizes a left abutment spillway excavated into a natural topographic bench. Spillway discharge flows overland to return to the stream channel. The RCC dam includes spillway centered on the dam structure. Both structures utilize a very similar outlet works. It consists of an intake tower with gates and controls, a 48-inch conduit, and an impact basin energy dissipater.

5.02. EMBANKMENT DAM SPILLWAY DESIGN.

The spillway will pass all normal overflow discharge up to the design flow of 5,800 cfs. Other reservoir discharge, such as draining for emergency maintenance, will be routed through the low-level outlet.

a. Features.

The spillway features are the approach channel, the formed concrete ogee (including the spillway crest), and the spillway chute. Due to the high level of energy dissipation in the chute, the embankment dam option does not require a separate energy dissipater.

b. Location.

The spillway will be located on the left abutment. The flat topography on this abutment will provide good spillway approach conditions with the least excavation. The left abutment also provides the shortest spillway chute, due to the alignment of the Deer Creek downstream of the dam site. Since the right abutment topography is much steeper, a 150-foot-wide spillway could not be practically located on this side. In addition, since the stream channel curves toward the left abutment downstream of the dam site, the spillway chute would be much longer if located on the right abutment. Therefore, locating the spillway on the left abutment requires the least site disturbance and has the lowest excavation cost.

c. Approach Conditions.

The spillway approach channel will be excavated to an elevation 4,355 ft, 5 ft below the spillway crest elevation 4,360 ft. The approach velocity will be under 6 feet per second (fps) for all flows up to the design discharge (5,800 cfs). The left bank of the channel will be excavated to an alignment perpendicular to the spillway crest (plate 5, appendix B). This will provide stable discharge conditions over the spillway up to the design flow rate.

d. Weir Geometry.

For ease of construction, the upstream face of the ogee will be vertical. The crest and downstream face of the ogee will follow standard ogee geometry for overflow spillways to provide an efficient spillway rating curve with a high discharge coefficient. The spillway is very wide in comparison to its design flow. The 150-foot-width spillway provides a low unit discharge (39 cfs per foot of spillway length) and a correspondingly low design head (4.4 ft). This minimizes pool fluctuation and energy dissipation requirements. It will also reduce resident fish loss, since the depth of flow over the weir crest will be very low. A typical spring runoff of 50 cfs will result in a flow depth of 3 inches over the spillway. It is expected that very few fish will be entrained at such a low depth, particularly given the low approach velocity (less than 0.1 fps for 50 cfs spillway flow).

e. Discharge Rating.

Due to the steep abutment slope (greater than .25 ft per foot), the spillway will operate unsubmerged up to and including the design discharge, 5,800 cfs. The discharge rating data for the 150-foot embankment dam spillway is shown in table 5-1.

Table 5-1. Discharge Rating for Embankment Dam Spillway Crest.

Flow Depth (ft)	Elev. ft	Flow Rate (cfs)	Flow Depth (ft)	Elev. ft	Flow Rate (cfs)	Flow Depth (ft)	Elev. ft	Flow Rate (cfs)
70.0	4360.0	94.0	59.2	4349.2	86.4	49.2	4339.2	78.8
68.9	4358.9	93.2	58.1	4348.1	85.7	48.3	4338.3	78.1
67.8	4357.8	92.5	57.1	4347.1	84.9	47.4	4337.4	77.3
66.7	4356.7	91.7	56.1	4346.1	84.1	46.4	4336.4	76.6
65.6	4355.6	91.0	55.1	4345.1	83.4	45.5	4335.5	75.8
64.5	4354.5	90.2	54.1	4344.1	82.6	44.6	4334.6	75.0
63.4	4353.4	89.5	53.1	4343.1	81.9	43.7	4333.7	74.3
62.3	4352.3	88.7	52.1	4342.1	81.1	42.8	4332.8	73.5
61.3	4351.3	87.9	51.2	4341.2	80.4	41.9	4331.9	72.8
60.2	4350.2	87.2	50.2	4340.2	79.6	41.1	4331.1	72.0

f. Downstream Energy Dissipation.

The left abutment is composed of fractured basalt that is likely to withstand the anticipated spillway flow velocities with limited erosion. Typical spring flows will be 3 to 4 fps at a depth of up to 0.25 ft (4 inches). The 100-year flow will be 1,273 cfs, with a depth of 0.66 ft (8 inches) and a velocity of about 13 fps. It is recommended that additional exploration be conducted to confirm the nature of the fracturing and establish with more certainty the extent of erosion at anticipated spillway flows. The chute will be formed as the unimproved abutment erodes. It is expected to have a high hydraulic

roughness (Manning n = 0.03 to 0.07), capable of dissipating the energy of the spillway design flow without the need for a formed stilling basin. Flow from the spillway will re-enter the main Deer Creek about 350 ft downstream of the spillway crest. After formation, the spillway chute is expected to have a width of about 150 ft and a longitudinal slope of about 0.20 ft per foot. In larger flows, it is expected that some fish will be entrained over the spillway. A section of large riprap (greater than a 2-foot diameter) will be placed in the spillway chute to kill any resident fish that become entrained in large flows.

5.03. THE RCC DAM SPILLWAY AND STILLING BASIN DESIGN.

The hydraulic structures necessary for the RCC option are similar in function to the embankment dam. The location and configuration of the spillway and outlet have been altered to fit the requirements of the RCC structure.

The spillway will pass all normal overflow discharge up to the design flow, 5,800 cfs. Discharges related to draining the reservoir for emergency maintenance will be routed through the low-level outlet.

a. Features.

The spillway will be composed of a formed concrete ogee crest, an RCC spillway chute, and an RCC stilling basin.

b. Approach Conditions.

The spillway approach velocity will be negligible, since the spillway is located near the middle of the dam at the deepest part of the reservoir with the crest parallel to the dam axis.

c. Weir Geometry.

In order to minimize stilling basin excavation costs, the RCC spillway length will be 100 ft, 50 ft shorter than the embankment spillway length. This will increase the design head on the spillway by 1.5 ft to a maximum depth of 5.9 ft over the spillway crest for the design flow of 5,800 cfs. The crest and downstream face of the ogee will follow standard ogee geometry for overflow spillways to provide an efficient spillway rating curve with a high discharge coefficient. This will result in little loss of resident fish, since depth of flow over the weir crest will be low. A typical spring runoff of 50 cfs will result in a flow depth of 4 inches over the spillway. This is slightly higher than with the embankment option, but it is still expected that very few fish will be entrained at such a low depth.

d. Discharge Rating.

The RCC Spillway rating is based on a maximum discharge coefficient of 4.03, spillway crest length of 100 ft, and two end contractions. The discharge rating data for the 100-foot RCC dam spillway are shown in table 5-2.

Table 5-2. Discharge Rating for RCC Dam Spillway Crest.

Flow Depth (ft)	Elev. Ft	Flow Rate (cfs)	Flow Depth (ft)	Elev. Ft	Flow Rate (cfs)	Flow Depth (ft)	Elev. ft	Flow Rate (cfs)
0.0	4360.0	0.0	2.1	4362.1	1065.3	4.2	4364.2	3439.7
0.1	4360.1	9.0	2.2	4362.2	1152.8	4.3	4364.3	3562.5
0.2	4360.2	25.8	2.3	4362.3	1243.5	4.4	4364.4	3686.8
0.3	4360.3	48.0	2.4	4362.4	1337.4	4.5	4364.5	3812.4
0.4	4360.4	74.7	2.5	4362.5	1434.6	4.6	4364.6	3939.4
0.5	4360.5	105.5	2.6	4362.6	1535.0	4.7	4364.7	4067.7
0.6	4360.6	140.2	2.7	4362.7	1638.7	4.8	4364.8	4197.4
0.7	4360.7	178.5	2.8	4362.8	1745.6	4.9	4364.9	4328.3
0.8	4360.8	220.4	2.9	4362.9	1855.8	5.0	4365.0	4460.6
0.9	4360.9	265.8	3.0	4363.0	1969.3	5.1	4365.1	4594.2
1.0	4361.0	314.5	3.1	4363.1	2086.1	5.2	4365.2	4729.0
1.1	4361.1	366.6	3.2	4363.2	2206.2	5.3	4365.3	4865.1
1.2	4361.2	422.0	3.3	4363.3	2329.7	5.4	4365.4	5002.4
1.3	4361.3	480.6	3.4	4363.4	2456.4	5.5	4365.5	5141.0
1.4	4361.4	542.4	3.5	4363.5	2586.6	5.6	4365.6	5280.7
1.5	4361.5	607.5	3.6	4363.6	2720.1	5.7	4365.7	5421.7
1.6	4361.6	675.8	3.7	4363.7	2847.0	5.8	4365.8	5563.9
1.7	4361.7	747.3	3.8	4363.8	2962.6	5.9	4365.9	5707.3
1.8	4361.8	822.0	3.9	4363.9	3079.6	5.964	4366.0	5800.0
1.9	4361.9	899.9	4.0	4364.0	3198.2			
2.0	4362.0	981.0	4.1	4364.1	3318.2			

e. Chute Geometry.

The spillway chute will be the same width as the spillway crest (100 ft) with 7-foot-high training walls to accommodate the design flow and the anticipated air bulking due to high-flow velocity in the chute. Since the RCC chute will be rough and flows, generally, will be very shallow, it is expected that resident fish passing over the spillway will not survive or escape downstream.

f. Stilling Basin.

The spillway stilling basin will be 40 ft long with a flat apron, no baffle blocks, an endsill approximately 4 ft in height, and constructed of RCC. The tailwater

will be controlled by critical flow depth over the endsill, since the downstream channel slope is critical. The stilling basin floor elevation is set so that the tailwater elevation corresponds to 85 percent of the sequent depth, per standard Corps design procedure.

g. Downstream Channel Protection.

As with the embankment option, large diameter riprap will be placed downstream of the stilling basin to protect the downstream channel from erosion and to assure that any fish surviving the spillway chute will be prevented from entering the downstream channel.

5.04. OUTLET WORKS DESIGN.

The primary purpose of the low-level outlet will be to drain the reservoir if emergency maintenance is required. In addition, the outlet valve can be used to regulate outflow for other uses if limited reservoir volume must be released in controlled amounts. However, the slide-gate arrangement will not be ideal for throttling flow. The designs of the outlet works for the embankment dam and the RCC dam are very similar.

a. Flow Requirements.

The low-level outlet is designed to discharge an average of 84 cfs while draining 90 percent of the reservoir volume within a 1-month period. The design flow rate will permit the evacuation of the reservoir to elevation 4,333.2 ft in 1 month during typical high-flow conditions, assuming 34 cfs reservoir drainage and 50 cfs inflow. This will allow reservoir evacuation and maintenance work to occur in the same year, if necessary.

b. Intake Structure.

An intake tower in the forebay is necessary to assure open-channel flow through the embankment. This is required for an embankment dam because pressure flow could result in leakage that would damage the embankment. The tower in the forebay will have a flow entrance at elevation 4,330 ft (the 100-year sediment level). The tower will house a trash rack, two slide-gates, and an inlet-control orifice. These features will provide protection against debris and sedimentation and will assure the outlet pipe does not pressurize. The tower will be submerged but will have slide-gate operators above the high-water level. This will provide a low-cost structure with redundant gates and accessible gate operators to assure the ability to drain the reservoir even if one gate fails to operate.

c. Outlet Conduit Flow Control Entrances.

An ungated orifice at the entrance to the outlet pipe will limit the flow in the outlet pipe to assure open channel conditions at all times. The two gates located above the outlet pipe can be partially closed to further limit reservoir outflow, if necessary.

d. Outlet Conduit.

The outlet conduit will be sloped to assure open channel flow at discharges up to 100 cfs.

e. Energy Dissipater.

An impact basin will be located at the downstream end of the outlet pipe. The impact basin will dissipate the energy in the outlet pipe discharge. This will provide erosion protection for the downstream channel. In addition, to assure that no resident fish are released into the downstream channel, the slope of the outlet pipe will be adjusted so that high-velocity flow will enter the impact basin. This will cause a high level of energy dissipation within the impact basin and is expected to kill any resident fish that may be drawn into the pipe during a reservoir drawdown.

f. Discharge Rating.

The discharge rating of the low-level outlet is based on an orifice with cross-sectional area of 1.75 square ft and a discharge coefficient of 0.8. The orifice will discharge into open channel at all design flows. The discharge rating data for the outlet is shown in table 5-3.

Table 5-3. Discharge Rate for Low-Level Outlet.

Flow Depth (ft)	Elev. ft	Flow Rate (cfs)	Flow Depth (ft)	Elev. ft	Flow Rate (cfs)	Flow Depth (ft)	Elev. ft	Flow Rate (cfs)
70.0	4360.0	94.0	59.2	4349.2	86.4	49.2	4339.2	78.8
68.9	4358.9	93.2	58.1	4348.1	85.7	48.3	4338.3	78.1
67.8	4357.8	92.5	57.1	4347.1	84.9	47.4	4337.4	77.3
66.7	4356.7	91.7	56.1	4346.1	84.1	46.4	4336.4	76.6
65.6	4355.6	91.0	55.1	4345.1	83.4	45.5	4335.5	75.8
64.5	4354.5	90.2	54.1	4344.1	82.6	44.6	4334.6	75.0
63.4	4353.4	89.5	53.1	4343.1	81.9	43.7	4333.7	74.3
62.3	4352.3	88.7	52.1	4342.1	81.1	42.8	4332.8	73.5
61.3	4351.3	87.9	51.2	4341.2	80.4	41.9	4331.9	72.8
60.2	4350.2	87.2	50.2	4340.2	79.6	41.1	4331.1	72.0

SECTION 6.0 - EMBANKMENT DAM

6.01. GENERAL.

The dam embankment will consist of an impervious center core supported with random fill shells. The core will have 1H on 1V slopes with a 12-foot top width and will be protected from piping by a downstream sand filter zone. The embankment crest will be approximately 80 ft above the foundation gravel in the valley floor. The core will be taken to the rock foundation, and a grout curtain will be installed beneath the dam.

6.02. DESIGN CRITERIA.

All design will be based on existing design parameters outlined in the following references and, in general, will conform to the following EM's, design manuals, and accepted engineering practices:

a. EM 1110-2-2300, *Earth and Rock-Fill Dams – General Design and Construction Considerations*, July 31, 1994.

b. EM 1110-2-1901, *Seepage Analysis and Control for Dams*, September 30, 1986.

c. EM 1110-2-1902, *Stability of Earth and Rock-Fill Dams,* April 1, 1970.

d. Bureau of Reclamation, *Design of Small Dams*, 1987.

6.03. EXPLORATIONS.

The NPT hired GeoEngineers, Inc., to perform exploration at the site. The Corps defined the scope of explorations to be performed. Exploration data is compiled in a report prepared by GeoEngineers, Inc., *Geotechnical Exploration and Testing Proposed Deer Creek Reservoir, Lewis County, Idaho*, January 8, 1999. Four core holes were drilled approximately along the proposed dam alignment: two holes in the valley floor and one hole in each abutment. These four holes were water pressure tested. Additionally, one core hole was drilled at a potential on-site quarry location. Thirteen test pits were dug over a portion of the proposed reservoir area. Laboratory testing was performed on test pit samples and petrographic analysis performed on various core samples.

6.04. LABORATORY TESTING.

The laboratory testing was also performed by GeoEngineers, Inc. No undisturbed sampling or testing was performed. Two composite samples were obtained from the test pits. The samples were visually classified, and Atterberg limits were obtained. The samples were compacted at or near 95 percent of the estimated

maximum dry density, and the following tests were performed. A consolidation test and shear strength test were performed on each sample, and one gradation test was also performed on the granular materials. Results of the laboratory testing can be found in the report by GeoEngineers, Inc.

6.05. FOUNDATION.

Generally, the site has overburden in the range of 0 to 9 ft in thickness. The overburden consists of clays and gravelly clays and sands. Those portions of the abutments contacting the core and filters will be trimmed to sound rock having a generally uniform slope estimated at 3 horizontal to 1 vertical. Excavation of the valley floor will be carried to approximately elevation 4,280 ft that will place the core on rock. The remainder of the valley floor will be stripped to a depth of 2 ft to remove overburden, brush, and trees from the surface. Grouting of the foundation will be required and must be completed in advance of embankment placement.

6.06. EMBANKMENT DESIGN.

The design is predicated on foundation conditions, borrow considerations, and stability analysis for various configurations of the embankment. There is adequate availability of impervious material in the proposed reservoir area. Therefore, the dam will have an impervious core in the middle section approximately 12 ft wide at the top with 1H to 2V side slopes. The filter zone on the downstream side of the core consists of 10 ft of horizontal width to facilitate construction equipment. The shell material will consist of the materials found in the reservoir area, consisting of sandy clays to clayey gravels. The downstream and upstream slopes will be protected by rock and cobble excavation from the spillway.

6.07. DESIGN STRENGTHS.

Design strengths for the core materials were determined from the triaxial shear and direct shear tests performed on sample number 1. Disturbed samples were remolded to 95-percent standard maximum density at optimum water content. Triaxial shear tests were conducted using unconsolidated, undrained shear test (Q tests) and consolidated, undrained shear test (R tests). Direct shear tests were used to determine the material consolidated, drained shear test (S tests). A summary of the design strength for the random fill materials are shown on table 6-1, and the core materials are shown on table 6-2. The design shear strengths for the gravel, sand, and riprap areas are conservative estimates based on references in the Bureau of Reclamation, *Design of Small Dams*.

Table 6-1. Slope Stability Design Values for Embankment Materials.

Material	γ_m[1/]	γ_{sat}[2/]	C[3/]	ϕ[4/]
Riprap	130	135	0	40
Sand Filter	125	-	0	33
Cobbles	127	130	0	35
Gravel	125	130	0	33
Nat. Ground	125	130	0	32
Rock	150	150	10000	50

[1/] Material unit weight.
[2/] Saturated unit weight.
[3/] Cohesion pounds per square inch (PSI).
[4/] Phi angle.

Table 6-2. Material Properties for Core and Fill Material from Laboratory Testing.

Material	γ_m	γ_{sat}	C	ϕ
Core				
S - Test	115	120	0	29
Q - Test			1160	8
R - Test			350	17
R' - Test			0	30
Fill				
S - Test	120	125	0	30
Q - Test			1580	9
R - Test			800	15
R' - Test			0	31

6.08. STABILITY ANALYSIS.

The upstream and downstream slopes were analyzed using the UTEXAS3 computer program for slope stability. The Spencer, Bishops, and Modified Swedish methods were analyzed using a circular failure mode. The design condition and resulting factor of safety is presented in table 6-3.

a. End of Construction.

Both upstream and downstream slopes were analyzed for this condition. The water table was assumed to be at ground surface. The Q strength was used for the core and fill material. The S strength was also tested for these materials.

b. Sudden Drawdown.

The upstream slope was analyzed for sudden drawdown from pool elevation 4,360 ft to pool elevation 4,330 ft (low-level outlet). The composite envelope for the R and S strengths was used as indicated in EM 1110-2-1902 for the core and fill materials. The S strength values were used for the granular materials

c. Steady Seepage.

The downstream slope was analyzed for steady seepage with a maximum operating pool and with a surcharge pool. An average of the R and S strengths was assumed for the core and fill materials. The assumed S strength values were used for the granular material. The failure surface for the minimum factor of safety was a shallow failure about 6 ft deep on the downstream slope. Since this is not a critical failure, a deep failure was forced on the program, and a higher factor of safety was obtained.

d. Earthquake.

There are no sand deposits to indicate a potential for liquefaction at the site; therefore, an earthquake analysis was not performed at this time. An analysis should be performed during the final design.

Table 6-3. Summary of Minimum Safety Factors.

Design Condition	**Safety Factor**
End of Construction Upstream	1.77
End of Construction Downstream	2.09
Sudden Drawdown	1.15
Partial Pool Upstream	1.69
Steady Seepage, elevation 4,360 ft	1.54 (Shallow Failure)
	1.71 (Deep Failure)
Steady Seepage, elevation 4,365 ft	1.70

6.09. SEEPAGE CONTROL.

In addition to the impervious core, a grout curtain will be established beneath the dam. The details of connecting the grout curtain to the embankment will be established during development of plans and specifications. At this time, the location and seepage control for the conduit will also be established. The conduit will be placed so that there is a minimum of 18 inches of filter material around the downstream third of the conduit.

6.10. SETTLEMENT.

Two consolidation tests were performed on the remolded clays. A settlement analysis using this data indicates that a maximum of 1 foot of settlement can occur in the core and embankment materials. Additionally, the Bureau of Reclamation recommends that an additional 1 percent of the dam height be provided for settlement on relatively noncompressible foundations. Therefore, an additional 2 ft of height was added to the dam for settlement, making the top of the dam at elevation 4,370 ft.

6.11. SOURCES OF CONSTRUCTION MATERIALS.

The core materials will be obtained from the valley floor in the pool area. The clay material is approximately 5 to 6 ft thick within the first 400 ft of the proposed dam. The random fill material will also be obtained from the valley floor. The clay material is underlain by a clayey sand to clayey gravel approximately 4 to 6 ft thick. Additional clayey gravels can be obtained up the valley to the extent of the investigations. To prevent excess seepage, a minimum layer of 2 feet of clayey gravel material will remain above the rock within 100 feet of the upstream toe of the embankment. The rocks for the slope protection will be obtained from the spillway excavation. The sand filter material will be crushed on-site.

6.12. FURTHER INVESTIGATIONS.

To better define construction quantities and the design values for the embankment materials, additional subsurface exploration should be performed. Two Standard Penetration Tests should be performed beneath the proposed embankment to determine soil properties and settlement characteristics of the existing overburden. Backhoe trenching should be performed in the vicinity of the proposed borrow pit to establish the amount and content of the borrow available. Additional testing should be performed on compacted samples from the test pits to determine the properties for the random fill.

6.13. CONSTRUCTION SCHEDULE.

Appendix E summarizes the tasks and schedule for performance of the dam construction.

SECTION 7.0 - ROLLER COMPACTED CONCRETE DAM

7.01. THE RCC AND STRUCTURAL DESIGN ISSUES.

a. Design References.

For the evaluation of this structure, stability analyses were not done. The construction constraints of the RCC dam result in a structural geometry that meets all the stability requirements. During final design (in conjunction with the preparation of plans and specifications), all loading conditions should be considered in order to verify and document that the structure is stable.

The design is based on accepted engineering practices. The following publications are used:

(1) American Concrete Institute (ACI) 318-83, *Building Code Requirements for Reinforced Concrete.*

(2) American Institute of Steel Construction (AISC), *Manual of Steel Construction*, Eighth Edition.

(3) EM 1110-2-2000, *Standard Practice for Concrete for Civil Works Structures, Change 1,* February 1, 1994.

(4) EM 1110-2-2200, *Gravity Dam Design*, June 30, 1995.

(5) EM 1110-2-2400, *Structural Design of Spillway and Outlet Works.*

(6) EM 1110-2-2902, *Conduits, Culverts, and Pipes,* October 31, 1995.

(7) ER 1110-2-1806, *Earthquake Design and Evaluation of Civil Works Projects*, July 3, 1969.

(8) Engineer Technical Letter (ETL) 1110-2-256, *Sliding Stability for Concrete Structures.*

(9) ETL 1110-2-265, *Strength Design Criteria for Reinforced Concrete Hydraulic Structures.*

(10) ETL 1110-2-303, *Earthquake Analysis and Design of Concrete Gravity Dams.*

b. <u>Dam Section Structural Analysis</u>.

Loading conditions (all of which are of short duration and infrequent occurrence) considered appropriate for the project will be taken from EM 1110-2-2200. Uplift will be assumed to vary in a straight line from full pool head at the heel to full tailwater head, if any, at the toe.

Design for earthquake loads will be investigated using the seismic coefficient method. The project is located in seismic Zone 2 where only moderate damage is normally considered probable, but local faulting is expected to be capable of inducing higher accelerations than the 0.1g[1] tabulated in ER 1110-2-1806. Because flooding and earthquakes are rare events, it is not considered reasonable to assume simultaneous occurrence. The combination was not considered in the stability analysis.

Final design of this structure requires a cracking analysis to be performed to verify that the anticipated mass volume changes can be accommodated by the materials and the jointing. The structure includes minimal jointing because materials will be designed to minimize volume changes, and the use of a membrane-type water barrier reduces the effects of transverse joints. The intent of this study is to estimate material properties and apply external boundary conditions that are considered reasonable worst case conditions. If the results show satisfactory or acceptable thermal performance, additional study and thermal control are not warranted.

c. <u>Other Concrete Structures</u>.

Conventional concrete will be used for the construction of the spillway cap, training walls, conduit encasement, outlet tower and impact basin, lift joint bedding, and foundation bedding.

Reinforced concrete structures will be designed with the design strength method in accordance with the current ACI Building Code, except as modified by ETL 1110-2-265. Design strength (f'c) of conventional concrete is generally 4,000 psi at 28 days. Allowable stress in reinforcing steel will be limited to 20,000 psi in hydraulic structures.

Structural steel will be American Society for Testing and Materials (ASTM) A36. Working stresses for hydraulic structures will be based on percentages of allowable stresses indicated in AISC for gates, bulkheads, and stoplogs.

The corrugated metal pipe (CMP) diversion conduit upstream of the dam will be designed for loadings from external soil and acting hydrostatic pressures according to EM 2220-2-2902. Under the body of the dam, the smooth pipe diversion/outlet conduit will be designed to withstand collapsing pressures from pore water or seepage. Pipe thickness for the outlet is not fixed by structural considerations.

[1] Mean acceleration.

Concrete encasement to carry construction loads will be provided below the body of the dam for all conduits.

7.02. CONSTRUCTION MATERIALS.

a. Quantities.

Estimated quantities for both conventional concrete and RCC are shown in table 7-1.

Table 7-1. Estimated Concrete Quantities.

Conventional Concrete	**Quantity**
Foundation Dental Concrete	200 cy
Spillway Crest and Training Walls	230 cy
Stilling Basin Training Walls and Endsill	214 cy
Intake Tower	56 cy
Impact Basin	22 cy
Conduit Encasement	83 cy
Roller Compacted Concrete	
Mass RCC	45,000 cy
Stilling Basin Invert RCC	400 cy

b. The RCC Materials.

(1) On-site Aggregates.

A rock source from which to produce RCC aggregate has been identified on the left abutment just upstream of the dam. If the left abutment spillway is selected for RCC, rock excavation from that construction will be used for a portion of the RCC aggregate. The quarry will be configured so that all the rock excavation will be done below the normal water surface elevation, negating the need to do quarry restoration. Initial evaluation of rock for use as RCC aggregate was done during the exploration phase. GeoEngineers, Inc., performed foundation drilling and core removal to characterize the foundation. One additional drilled core was removed from the quarry location. Samples of the rock core were sent to Construction Technologies Laboratories for petrographic evaluation. The evaluation concluded that the rock is good quality and a viable material for use as RCC aggregate. A preliminary combined aggregate gradation for the 2-inch maximum size aggregate (MSA) is anticipated. Gradation modifications may occur during mix design studies, based on mix performance. The inclusion of nonplastic fines of 3 to 6 percent passing the 75 micron standard sieve is anticipated. Future work to be done includes the performance of

aggregate processing and mix design studies that are required for this new undeveloped source.

(2) Off-site Aggregates.

Because of the remote location of the site, extensive use of commercial aggregates is not anticipated. Certainly, on-site processing will be done for the large quantity of RCC aggregates. Some of the conventional concrete placements may use commercially produced aggregates. It is likely that aggregates would be hauled to the site and batched on-site with other materials for conventional concrete. While no commercial suppliers of aggregate exist in the immediate vicinity, rock crushing is done routinely in the area for surfacing roads. Test pits in the reservoir indicate that sand may be produced from on-site deposits.

(3) Cementitious Materials.

Portland cement (conforming to ASTM C 150, type II, low alkali, with the heat of hydration limited to 70 calories per gram) will be used for all RCC mixtures and other on-site batched mixtures. Cement used in conventional concretes batched at local concrete suppliers and used for non-mass placements will not have the heat of hydration limitation. Cement meeting these requirements is available in the region. Pozzolan (conforming to ASTM C 618, class F) may be used as a cement replacement for the RCC mixes at a replacement rate of 30 to 50 percent by volume. Bedding mixes and selected conventional concrete placements will also contain pozzolan at cement volume replacements not exceeding 40 percent, depending on the mix requirements. No chemical admixtures are anticipated for the Deer Creek mixtures.

(4) Mixing Water.

Water for concrete and RCC production is available from surface water. Ground water may be a viable option; however, no active wells exist in the vicinity of the construction site. The effects of water on properties of concrete should be investigated during production of mix design trials.

(5) Mixture Proportions.

Several RCC mixes are anticipated for Deer Creek Project construction. The mass RCC mix constitutes the largest volume of RCC (consisting of a lean mix proportioned for minimal heat generation and maximum aggregate size). The stilling basin surface will be a higher strength mass mix proportioned to have 1 year compressive strengths in excess of 3,000 psi with a maximum aggregate size of 1 1/2 to 2 inches (see table 7-2).

Table 7-2. The RCC Mix Composition.

Mix Designation	Cement (lbs/cy)	Fly Ash (lbs/cy)	MSA (inch)
RCC Mass Mix	120	60	1 1/2
RCC Stilling Basin Mix	200	100	1 1/2

The contract requirements will be based on actual mix performance, not minimum required performance. The minimum design strength of the mass mix at 1 year is estimated to be less that 1,500 psi. However, mix proportioning will result in mixes having 1 year compressive strengths of 2,000 psi.

7.03. THE RCC PRODUCTION AND PLACEMENT.

a. Aggregate Processing.

The quarry is located on the left abutment. Approximate limits are shown on plate 3 (appendix B). Specifications will require aggregates to be produced and stockpiled into at least two size groups with a possible additional separate stockpile for blend sand. Contract specifications will require that 75 percent of the RCC aggregate be produced prior to the start of RCC placement, and the remaining 25 percent produced prior to the placement of 50 percent of the RCC. Aggregates will be stockpiled into a minimum of three size groups: two coarse aggregate and one fine aggregate. Blend fines may also be stockpiled separately.

b. Plant Requirements.

The RCC batching and mixing plant must be capable of producing a sustained peak production rate of 150 cy per hour to sustain the maximum reasonable capability of the field placement crews and equipment. This requires a plant that has a rated capacity of approximately 200 cy per hour. At 150 cy per hour plant production and 20 working hours per day, the maximum rate of dam rise is approximately 6 ft per day.

c. The RCC Placement.

For a dam of this size and access limitations, only a few options to transport RCC exist. Vehicle hauling of RCC from the plant to the placement should not be allowed because serious contamination and lift surface degradation are likely. Conveying RCC to the placement site is the only practical method of transport. At the placement site, the material may be transported to its final location by conveyor or by front-end loader. The anticipated design and construction requirements for this structure will allow front-end loader transportation for this project.

The RCC will be deposited and spread into uniform layers approximately 12 inches thick by the front-end loader. A small dozer, similar to a Caterpillar D3 is

suitable for spreading RCC at the specified production rate. Compaction will be done by vibratory rollers, providing a minimum total dynamic force of 500 pounds per lineal inch of drum width and a minimum vibration frequency of 1,700 vibrations per minute (vpm). A double vibrating drum and a self-propelled, 10-ton vibratory roller easily meet this specification. The contractor will be required to provide compaction exceeding 98 percent of the maximum wet density of the RCC measured during each test section. It is recognized that gradation variations and inherent proportioning variation may affect the actual field maximum density.

Moist curing will be required on the exposed horizontal surfaces of the RCC. Formed surfaces such as vertical faces using conventional concrete will receive a membrane curing compound seal. Paneled surfaces will not be cured. The sloped surfaces of the RCC will receive a continuous application of moisture. A continuous application of moisture will be required on the exposed top surfaces of the RCC during construction. While this provides adequate curing, the primary benefit is to promote lift joint bonding. The manual application of spray water will be done from hoses located at several points on the upstream and downstream faces of the structure. Since the structure has a maximum length of 600 ft and a width of 100 ft, a minimal number of hoses and outlets will be required.

d. Joints and Joint Treatment.

(1) Contraction Joints.

The principal function of contraction joints is to limit the zones of significant foundation restraint to the lower regions of the dam, thereby, restricting potential cracking to those regions in the mass. Theoretically, the contraction joint spacing can be reduced to a point where no cracking will occur. Thermal studies will dictate the extent of contraction joint construction

(2) The RCC to Foundation Rock Joint.

After excavation, cleaning, and placement of dental concrete, the rock to RCC contact surfaces will receive an application of a conventional concrete bedding. This bedding concrete will be a high slump, 3/4 inch MSA, high sand content, and highly retarded mix. The purpose of the bedding concrete is to develop shear sliding resistance at the RCC to rock contact. The concrete will be spread as thin as possible (about 1 inch in thickness) across most rock contact surfaces. The foundation bedding concrete thickness will be increased to about 6 inches and the workability decreased for placement against significantly sloped and irregular rock surfaces.

(3) The RCC Lift Joints.

Shear properties along the RCC lift surfaces are anticipated to be 20 psi cohesion assuming a minimum friction angle of 45 degrees. Static stability and seismic analyses will need to be done to confirm the required material properties for the

actual structural configuration. For conditions where shear performance is below requirements, the use of bedding mortar applied to the surface is an acceptable solution. Mix design studies should include the determination of lift joint shear strength values for the Deer Creek mixes.

e. The RCC Slopes and Formed Faces.

(1) Upstream Face of Dam.

Vertical faces for RCC are required at the upstream face of the dam. While vertical facings can be constructed by extruded curb techniques or movable forming systems, cost estimates show that precast panel systems continue to be the most cost effective method for structures of this size and configuration. At the upstream, a precast panel system is to be installed from abutment to abutment. Each panel will contain several embedded bar straps through which bent anchor bars will hook and anchor the panel to the RCC fill. This anchorage allows vertical flexibility in the placement of RCC while anchor bars provide a positive anchor for the panels. During panel installation and adjacent RCC placement, strongbacks will be installed that will provide horizontal restraint and an alignment guide for the panels.

A PVC membrane is attached to each panel during the fabrication process. During panel installation, the PVC is welded at each panel joint to produce a continuous impervious membrane at the upstream face of the dam.

(2) Downstream Face of Dam.

The downstream face of the dam is to be the natural slope formed by placing RCC. The surface will be trimmed with an excavator during placement to maintain a uniform appearance.

7.04. MISCELLANEOUS ISSUES.

a. Spillway and Training Wall Segments.

The stilling basin consists of an invert slab construction of RCC. The thickness of the slab will depend on the uplift forces and the extent of anchoring. The slab is bounded on the downstream with a conventional concrete endsill and on the sides with conventional concrete training walls. Construction of the endsill may precede RCC placement. Construction of the training walls will follow RCC placement. The spillway chute is bordered by conventional concrete training walls. The construction of these walls will follow RCC placement. The overflow crest and approach apron of the spillway is also constructed of conventional concrete placed after completion of RCC placements.

b. Instrumentation.

Instrumentation may consist of several piezometers located on and adjacent to the structure. Horizontal movement of the structure can be monitored by survey methods from several monuments located along the reservoir in the vicinity of the dam.

c. Internal Gallery.

A gallery is not to be constructed in the dam. Because of the relatively low RCC volume, the construction of a gallery is costly and can be eliminated by proper design. Alternate approaches to installing grout curtains can be done and designs can accommodate few or no drains.

7.05. CONSTRUCTION PHASE.

a. Safety Issues.

This discussion is not intended to encompass all the safety issues at the Deer Creek Project site during construction but to highlight some of the more obvious considerations. The downstream face of the RCC overflow and nonoverflow sections will not be formed and will have a design slope of .9H to 1.0V. As the placement progresses, the section width becomes narrower, creating a vehicle congestion problem and pedestrian hazards. Portable guardrails will be attached to the panels or forming system on the upstream face and embedded into the RCC on the downstream face. Preventing vehicles from driving off the face of the dam is difficult to achieve, therefore, "safety zones" will be implemented. Rollers will not be allowed to compact material within 3 ft of the downstream face. Compaction will be done by manually-guided equipment.

b. Quality Control/Assurance.

It is recommended that adequate field staff be provided to implement a quality assurance program. Specifications should be clear as to what the contractor's requirements are for instituting and maintaining a quality control program for construction. The specifications will require that the contractor's quality control testing be provided by an independent, qualified materials testing organization. Numerous operations for both conventional concrete and RCC will require quality control and assurance measures. A typical staff for a project of this magnitude (assuming the construction is to be done during two shifts) is show below:

- Project Engineer
- Technical Representative
- Materials Technician
- Materials Assistant
- Two Field Inspectors

c. Construction Schedule.

Appendix E summarizes the tasks and schedule for performance of the dam construction.

SECTION 8.0 - PROJECT COSTS

8.01. GENERAL.

Construction costs were developed from the engineering designs for this evaluation report and are based on the scope of work, assumptions, and methodology presented. Estimates were completed for two options: an earthen embankment dam and an RCC dam. This evaluation report documents the assumptions and quantities used in the concept estimates for the construction efforts involving the reservoir, access roads, and dam.

8.02. METHODOLOGY.

Conceptual level cost estimates (appendix A) were developed for each of the two options. The cost estimates include costs for construction contracts, engineering and design services, construction management services, and overall project management. Construction costs were prepared using the Tri-Service Automated Cost Engineering System (TRACES) software. The estimate is based on a work breakdown structure (WBS) that was developed at seven levels as follows: project, feature, subfeature, element, bid item, assemblies, and detail.

The major assumptions used in preparing the estimate are as follows:

- No fish passage around the projects will be maintained during and after construction.
- The rock sources identified will provide sufficient quantity and quality of material.
- The water sources identified will provide sufficient quantity and quality of water.
- Other assumptions are documented in the detailed estimate.

Because of the short construction season at the Deer Creek Project site, overtime is required for portions of this estimate. Specifically, it is required for production, transportation, and placement of rock, fill, RCC, concrete, riprap, and excavation of the embankments. Work hours for these tasks were assumed to be two 10-hour shifts per day, 6 days a week. Sand and gravel required for the various construction efforts is assumed to be available within 1 mile of the dam site. It is assumed that rock and riprap can be quarried from the spillway excavation or a quarry adjacent to the spillway excavation.

The present access roads are Lewis County Roads that need to be improved by regrading and installing crushed rock surfacing.

The present wooded and meadow areas, within the reservoir, need to be ready for the impounding of water behind the dam. The trees and brush need to be removed and disposed.

The estimates are based on use of common equipment and standard construction techniques in dam construction. Equipment is assumed to be available on the West Coast and is reflected in the mobilization/demobilization costs. A sufficient labor force is assumed to be available in the Lewiston, Idaho/Clarkston, Washington, area.

8.03. BASIS OF ESTIMATE.

Costs are based on a typical contract bidding process. The estimate assumes three contracts would be awarded separately. One contract will be awarded for the access roads, another for the reservoir preparations, and the third for dam construction. More efficient contract combinations may be possible when work tasks are better developed. The determination of the number of contracts will ultimately depend on the schedule of work and the cost effectiveness of contract combinations.

Markups (*e.g.,* field office overhead, home office overhead, and profit and bond) were applied to the proposed prime contractors and subcontractors. Tribal Employment Rights Ordinance (TERO) tax was also included. Rates used were based on historical averages for similar-sized jobs.

Escalation was calculated to reflect the cost of inflation using EM 1110-2-1304, *Civil Works Construction Cost Index System* (*CWCCIS*).

The estimate uses Davis-Bacon Labor.

Equipment rates are from Engineer Pamphlet 1110-1-8, Volume 8, September 1997, *Construction Equipment Ownership and Operating Expense Schedule*.

Construction costs were prepared using the U.S. Army Corps of Engineers, *TRACES, Unit Price Book 1999*, prepared by R.S. Means Company, Inc.

Contingencies were developed in accordance with the contingency guidance provided in ER 1110-2-1302, *Civil Works Cost Engineering.*

8.04. PROJECT COST SUMMARY.

The total project cost for the Deer Creek Project using an embankment dam, is estimated at $5.68 million. This includes contingency, engineering, construction management, and escalation to the midpoint (July 1999) of construction.

The total project cost for the Deer Creek Project using an RCC dam, is estimated at $6.38 million. This includes contingency, engineering, construction management, and escalation to the midpoint of construction.

SECTION 9.0 - CONCLUSIONS

9.01. HYDROLOGY.

- The spillway is sized for one-half of the PMF at 5,800 cfs.
- Wave height is calculated at 3 ft.
- Drawdown capacity is set at 30 days to evacuate to elevation 4,330 ft during peak flows.
- The 100-year sediment accumulation is estimated at 400 acre-feet.
- No additional modifications are needed to accommodate a dam-break flood routing.

9.02. GEOLOGY.

- Dewatering for excavations deeper than 5 ft in the valley floor may be required.
- A single line grout curtain will be sufficient for foundation treatment.
- The left abutment provides an ideal location for an auxiliary spillway.

9.03. ACCESS ISSUES.

- The road between Soldiers Meadow Road and the Deer Creek Project site needs to be upgraded to an all-weather road and turnouts added.
- Sections of new road are required.
- Construction of the project requires that road improvements be made during the construction season prior to dam construction. This allows early start for construction of the dam features.

9.04. HYDRAULIC STRUCTURES.

- The embankment dam includes a left abutment spillway with a 150-foot-long overflow adequate for reservoir water surface control. A downstream rock apron will provide a trap for escaped fish.
- For the RCC dam, a 100-foot overflow spillway centered on the structure will provide a reservoir water surface control. A downstream rock apron will provide fish trap.
- Intake structures are provided for low-level outlet capability and for special water surface control measures.
- An impact basin provides energy dissipation for outlet conduit.
- Stream diversion can be provided by an impoundment berm and CMP piping, or use of an outlet conduit, or a combination.

9.05. EMBANKMENT DAM.

- Sufficient materials are available in the reservoir area to construct an embankment dam.
- The embankment dam is to be primarily impervious fill with filters and shell. The top of the dam is set at elevation 4,370 ft. The section is stable against slope failures for sudden drawdown and earthquake with an upstream slope of 2.5H to 1V and the downstream slope of 3.0H to 1V.

9.06. THE RCC DAM.

- Sufficient materials are available in the reservoir area to construct an RCC dam.
- The RCC dam has a vertical upstream face and a 1V to 0.9H downstream slope. An impervious poly-vinyl chloride (PVC) membrane is incorporated into the upstream face construction.

9.07. PROJECT COST.

- The total project cost for the Deer Creek Project, using an embankment dam, is estimated to be $5.0 to $6.3 million. This includes contingency, engineering, construction management, and escalation to the midpoint of construction.
- The total project cost for the Deer Creek Project, using an RCC dam, is estimated at $5.0 to $6.3 million. This includes contingency, engineering, construction management, and escalation to the midpoint of construction.

SECTION 10.0 - RECOMMENDATIONS

Concept-level cost estimates show the total cost of the project ranges between $5.0 million to $6.3 million regardless of whether the structure is an embankment dam or an RCC dam. Both structures are configured for minimal maintenance, unattended operation, and ease of construction. Consequently, the selection of the type of structure is not based on cost but should be based on other factors. Those factors include aesthetics, area disturbance, and operational and maintenance requirements. It is recommended that during the design phase of the project, Tribal goals and concerns be more fully developed in order to establish which structure best meets the needs and operational mode of the Tribe.

A detailed design of the dam must include additional explorations to identify the unexplored rock intrusion in the foundation and to better characterize materials forming the spillway and the extremities of the dam structure.

Additional test pits are necessary to better quantify and qualify material sources for the various fill, core, and rock materials used for both structures. Additional materials testing will be necessary to characterize the range of materials anticipated for use.

A more comprehensive flood inundation evaluation is required to ascertain the downstream effects of dam failure.

APPENDIX A

Cost Estimates

1. Deer Creek Reservoir, Earthen Dam and Access Roads
2. Deer Creek Reservoir, RCC Dam and Access Roads

5A

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, EARTHEN DAM AND ACCESS ROADS — DISTRICT: WALLA WALLA

LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO — P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 / EFFECTIVE PRICING LEVEL: 1 OCT 99 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: 1999 / EFFECT. PRICING LEVEL: 1 OCT 99 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ SPENT THRU FY 99 ($K)	COST ($K)	CNTG ($K)	FULL ($K)
03.--	RESERVOIRS	114	23	20%	137	117	23	140		126	25	151
04.--	DAM	3,366	673	20%	4,039	3,454	691	4,145		3,730	746	4,476
08.--	ACCESS ROAD	774	155	20%	929	795	159	954		837	167	1,004
	GOVERNMENT FURNISH SERVICES											
	TOTAL CONSTRUCTION COSTS =====:	4,255	851	20%	5,106	4,366	873	5,239		4,693	938	5,631
01---	LANDS AND DAMAGES											
18---	CULTURAL RESOURCES											
21---	RECONNAISSANCE STUDIES											
22---	FEASIBILITY STUDIES											
30---	PLANNING, ENGINEERING & DESIGN	523	103	20%	626	537	105	642		563	109	672
31---	CONSTRUCTION MANAGEMENT	29	6	21%	35	29	6	35		32	6	38
	TOTAL PROJECT COSTS ==========>	4,807	960	20%	5,767	4,932	984	5,916		5,288	1,053	**6,341**

THIS TPCS REFLECTS A PROJECT COST CHANGE OF $

DISTRICT APPROVED: ~~~ ~~~~~~ ~~~~~~~~

DISTRICT APPROVED DATE: _____/______/______

TOTAL FEDERAL COSTS ==============> 6,341

TOTAL NON-FEDERAL COSTS ==========>

THE MAXIMUM PROJECT COST IS =======> $

~~~~~~~~ ~~~~~~~~

______________________ CHIEF, COST ENGINEERING, Kim Callan

______________________ CHIEF, REAL ESTATE, Richard Carlton

______________________ CHIEF, PLANNING, Dennis Cannon

______________________ CHIEF, ENGINEERING, Surya Bhamidipaty

______________________ CHIEF, OPERATIONS, Wayne John

______________________ CHIEF, CONSTRUCTION, John Treadwell

______________________ CHIEF, CONTRACTING, Jackie Anderson

______________________ PROJECT MANAGER, Debbie Willis

______________________ CHIEF, PM-PB, George Veighey

______________________ DDE (PM), acting David Keller

DIVISION APPROVED:

DIVISION APPROVED DATE: _____/______/______

________________ CHIEF, COST ENGINEERING, Wally Brassfield

________________ DIRECTOR, REAL ESTATE, Cynthia Brown

________________ DIRECTOR OF PROGRAM MANAGEMENT, Mike White

________________ DIRECTOR OF ENGINEERING & TECHNICAL SERVICES, Jim Crews

________________ CHIEF, CIVIL PROGRAMS, Clyde Barnhill

Walla Walla District

NOTE: Valid only when completely signed.
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THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, EARTHEN DAM AND ACCESS ROADS — DISTRICT: WALLA WALLA
LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO — P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 / EFFECTIVE PRICING LEVEL: 1 OCT 99 — COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: 1999 / EFFECT. PRICING LEVEL: 1 OCT 98 — OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	....FULLY FUNDED ESTIMATE.... — FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
03	RESERVOIRS	114	23	20%	137	2.6%	117	23	140	1 QTR 02	8.0%	126	25	151
	Deer Creek Reservoir - Approx. 111 Acres													
	LETTER REPORT dated, May 1999, to evaluated dam alternatives for the Deer Creek Site for Nez Perce Tribe.													
	TOTAL CONSTRUCTION COSTS =====:	114	23	20%	137		117	23	140			126	25	151
01---	LANDS AND DAMAGES													
22---	FEASIBILITY STUDIES													
30---	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 01	5.3%	1		1
1.0%	Planning & Environmental Compliance	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
5.0%	Engineering & Design	7	1	20%	8	2.6%	7	1	8	1 QTR 01	5.3%	7	1	8
1.0%	Engineering Tech Review & VE	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
1.0%	Contracting & Reprographics	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
3.0%	Engineering During Construction	4	1	20%	5	2.6%	4	1	5	1 QTR 02	8.0%	4	1	5
31---	CONSTRUCTION MANAGEMENT													
7.0%	Construction Management	8	2	20%	10	2.6%	8	2	10	1 QTR 02	8.0%	9	2	11
0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 02	8.0%	1		1
	TOTAL COSTS ==================>	141	27	19%	168		144	27	171			154	29	183
06.2--	GOVERNMENT FURNISH MATERIALS													
30---	PLANNING, ENGINEERING & DESIGN													
7.0%	Engineering & Design													
1.0%	Contracting & Reprographics													
	TOTAL GFS COSTS =====>													
	MISC. COSTS FOR ALL PROJECTS													
18---	CULTURAL RESOURCES													
30---	ANOTHER MISC. E & D COSTS													

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, EARTHEN DAM AND ACCESS ROADS — DISTRICT: WALLA WALLA
LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO — P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

		CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 EFFECTIVE PRICING LEVEL: 1 OCT 99				AUTHORIZ./BUDGET YEAR: 1999 EFFECT. PRICING LEVEL: 1 OCT 98				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
04.--	DAM													
04.01	MAIN DAM	2,621	524	20%	3,145	2.6%	2,689	538	3,227	1 QTR 02	8.0%	2,904	581	3,485
04.02	SPILLWAY	328	66	20%	394	2.6%	337	67	404	1 QTR 02	8.0%	364	72	436
04.03	OUTLET WORKS	417	83	20%	500	2.6%	428	86	514	1 QTR 02	8.0%	462	93	555
	Compacted Earthen Dam													
	LETTER REPORT dated, May 1999, to evaluated dam alternatives for the Deer Creek Site for Nez Perce Tribe.													
	TOTAL CONSTRUCTION COSTS =====:	3,366	673	20%	4,039		3,454	691	4,145			3,730	746	4,476
01---	LANDS AND DAMAGES													
22---	FEASIBILITY STUDIES													
30---	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	26	6	20%	32	2.6%	27	6	33	1 QTR 01	5.3%	28	6	34
1.0%	Planning & Environmental Compliance	35	7	20%	42	2.6%	36	7	43	1 QTR 01	5.3%	38	7	45
5.0%	Engineering & Design	173	34	20%	207	2.6%	178	35	213	1 QTR 01	5.3%	187	37	224
1.0%	Engineering Tech Review & VE	35	7	20%	42	2.6%	36	7	43	1 QTR 01	5.3%	38	7	45
1.0%	Contracting & Reprographics	35	7	20%	42	2.6%	36	7	43	1 QTR 01	5.3%	38	7	45
3.0%	Engineering During Construction	101	19	20%	120	2.6%	104	20	124	1 QTR 02	8.0%	112	22	134
31---	CONSTRUCTION MANAGEMENT													
7.0%	Construction Management	8	2	20%	10	2.6%	8	2	10	1 QTR 02	8.0%	9	2	11
0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 02	8.0%	1		1
	TOTAL COSTS ==================>	3,780	755	20%	4,535		3,880	775	4,655			4,181	834	5,015
06.2--	GOVERNMENT FURNISH MATERIALS													
30---	PLANNING, ENGINEERING & DESIGN													
15.0%	Engineering & Design													
1.0%	Contracting & Reprographics													
	TOTAL GFS COSTS =====>													

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, EARTHEN DAM AND ACCESS ROADS — DISTRICT: WALLA WALLA

LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO — P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 / EFFECTIVE PRICING LEVEL: 1 OCT 99 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: 1999 / EFFECT. PRICING LEVEL: 1 OCT 98 OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	.........FULLY FUNDED ESTIMATE......... FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
08.--	ACCESS ROAD	774	155	20%	929	2.6%	795	159	954	1 QTR 01	5.3%	837	167	1,004
	Improve Dirt Access Roads, Approx 14.22 Miles													
	LETTER REPORT dated, May 1999, to evaluated dam alternatives for the Deer Creek Site for Nez Perce Tribe.													
	TOTAL CONSTRUCTION COSTS =====:	774	155	20%	929		795	159	954			837	167	1,004
01---	LANDS AND DAMAGES													
22---	FEASIBILITY STUDIES													
30---	PLANNING, ENGINEERING & DESIGN													
1.5%	Project Management	13	2	20%	15	2.6%	13	2	15	1 QTR 00	2.6%	13	2	15
1.0%	Planning & Environmental Compliance	8	2	20%	10	2.6%	8	2	10	1 QTR 00	2.6%	8	2	10
5.0%	Engineering & Design	40	8	20%	48	2.6%	41	8	49	1 QTR 00	2.6%	42	8	50
1.0%	Engineering Tech Review & VE	8	2	20%	10	2.6%	8	2	10	1 QTR 00	2.6%	8	2	10
1.0%	Contracting & Reprographics	8	2	20%	10	2.6%	8	2	10	1 QTR 00	2.6%	8	2	10
3.0%	Engineering During Construction	23	5	20%	28	2.6%	24	5	29	1 QTR 01	5.3%	25	5	30
31---	CONSTRUCTION MANAGEMENT													
8.0%	Construction Management	9	2	20%	11	2.6%	9	2	11	1 QTR 01	5.3%	10	2	12
1.5%	Project Management	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
		885	178	20%	1,063		908	182	1,090			953	190	1,143
06.2--	GOVERNMENT FURNISH MATERIALS													
30---	PLANNING, ENGINEERING & DESIGN													
15.0%	Engineering & Design													
1.0%	Contracting & Reprographics													
	TOTAL GFS COSTS =====>													

DEER CREEK EARTH DAM & ROADS
Near Winchester, Northern Idaho
PRICE LEVEL 1 Oct 1998
SALES TAX RATE 5.0%, TERO 1.5%
--FOR OFFICIAL USE ONLY--

Designed By: Walla Walla Corp's Engineers
Estimated By: Karl Pankaskie

Prepared By: Walla Walla Cost Engineer Branch
Kim Callan, CHIEF, COST ENGR

Preparation Date: 04/16/99
Effective Date of Pricing: 10/01/99
Est Construction Time: 250 Days

Sales Tax: 5.00%

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DEER CREEK DAM PROJECT DESCRIPTIONS

Main Dam
This option for Deer Creek Dam will be a straight-axis gravity dam structure approximately 600 feet long at the top of the dam. The dam structure will be 80 feet high measured from the deepest point in the foundation. The hydraulic head will be 70 feet measured from the assumed invert elevation of the streambed.

This estimate consists of costs to construct an embankment dam. The embankment dam requires about 5-feet of freeboard for wave action and settlement and an additional 5 to 6-feet for discharge head over the emergency spillway.

The dam center has an impervious core (CH) with a downstream sand filter. In addition to the impervious core, an 80' deep, 5' space, grout curtain will be established beneath the dam to try to reduce leakage beneath the dam. The core is surround with random fill. The upstream outer edges of the random fill are protected with a 12" layer of riprap bedding and then a 30" layer of riprap. The downstream outer edges of the random fill are protected with a 9" layer of gravel bedding and then an 18" layer of cobbles.

Spillway
An overflow emergency spillway with a 150-foot crest length is proposed. The spillway will be constructed on the left abutment where a natural saddle would allow for an overland flow of water away from the embankment and back into the Deer Creek downstream of the dam. The spillway features are the approach channel, the formed concrete ogee (including the spillway crest), and the spillway chute.

Outlet Works and Impact Basin
The outlet works consists of an intake tower with gates and controls, a 48-inch conduit, and an impact basin energy dissipater.

A low-level intake structure would be constructed upstream of the dam, connected to the outlet conduit pipe for delivering water downstream through the dam and back into Deer Creek through an outlet structure. This inlet concrete box structure will have two slide gates with operators to control the flow of water through the structure.

The outlet conduit pipe will include a concrete embedded 48-inch steel pipe conduit. This pipe will also be used as part of the dewater works.

The impact basin structure would be constructed downstream of the dam and connected to the outlet conduit pipe for delivering water back into the stream. The concrete box structure will have baffles in it to dissipate water energy and to allow proper flow back into the stream.

Conventional concrete will be used for construction of the spillway cap, training walls, conduit encasement, intake structure, impact basin structure, and foundation bedding.

Reservoir

The Deer Creek reservoir is approximate 1.5 miles in length. The reservoir basin area at the dam site is approximately 111 acres. Some of the reservoir is forested and will need some preparation for the water that will be backup from the dam.

Access Road
Approximately 14.22 miles of access roads will need some improvements. The existing dirt roads shall be leveled, graded, and compacted. . Four inches of base material will be placed, graded, and compacted with two inches of gravel top course material placed, graded and compacted on top. This should provide an adequate foundation for the vehicles to access the dam site. A one-lane road with turnouts every 2,000 feet is suggested. Plate - 3 shows the locations of roads needed to be improved and new road sections that will be needed to connect them. New road sections and turnouts should be placed in the field to minimize the amount of environmental damage. As shown on plate 3, some construction roads will need to be 2 lane for construction traffic.

BASIS OF DESIGN
This estimate is for letter report dated May 1999 to evaluate dam alternatives for the Deer Creek Site for the Nez Perce Tribe.

CONSTRUCTION SCHEDULE
The contractor shall commence work under this contract within 10 calendar days of receiving the notice to proceed; prosecute said work diligently; and complete the entire work ready for use, within the time frame below:
Construction period of the road is unknown at this time.
Construction period of the reservoir is unknown at this time.
Construction period of the dam is unknown at this time.

CONSTRUCTION WINDOWS
Construction windows of the all work are unknown at this time.

OVERTIME
This estimate contains overtime to complete the project because of the short construction seasons due to high mountain weather.
Overtime was used in the development for the following item costs:
Quarry, drilling, and blasting work
Drilling, and grouting work
High volume earthmoving work
High volume RCC work

The standard contingency of 20% was used for this project.

ACQUISITION PLAN
The three low bidding contracts are required as follows 1) constructing the main dam, 2) constructing the roadwork, and 3) clearing the reservoir.

SUB-CONTRACTING PLAN
The following are subcontractors on this project:
Crushing and Batching Subcontractor (AH)
Drilling Subcontractor (AG)
Blasting Subcontractor (AI)

Grouting Subcontractor (AK)
Shotcrete Subcontractor (AL)
Fencing Subcontractor (AF)
Guard Rail Subcontractor ()
Sitework Subcontractor ()

It is assumed that the prime contractor will do the rest of the work.

PROJECT CONSTRUCTION

SITE ACCESS

Deer Creek Dam site is located on Deer Creek in Lewis County, Idaho and extends across Sections 18, 20, and 28 in T.32N, R.3 W., Boise Meridian. It is located on lands owned by the Nez Perce Tribe in the heart of Nez Perce National Forest. The site is approximately 14 miles south of Winchester, Idaho.

BORROW AREAS

The borrow sources for Deer Creek earth embankment dam is as follows:
The impervious core material (CH) will be obtained from excavating the valley floor in the pool area. The CH material will be approximately 5 to 6 feet thick within the first 400 feet of the proposed dam. The clay material will be underlain by clayey sand to clayey gravel approximately 4 to 6 feet thick. Additional clayey gravel can be obtained up the valley to the extent of the investigations.

The random fill material will be obtained from excavating the valley floor.

The sand filter, cobbles or gravel bedding, riprap or cobbles will be available by process crushing (at the same time) materials from the spillway excavation, left abutment quarry or access road quarry. Note: In the quarry site and at a depth of about 15-feet, rocks of 8-to 24-inch size are suitable to be process into riprap or cobbles.

The borrow sources for concrete aggregates will be available by process crushing material from the same sources. Cement can be hauled in and stored on site.

The water source for earth compaction and concrete production will be available from surface water. Upstream of the embankment material sources, a small dike with a culvert will be built. The structure will be constructed to store water for earth compaction and concrete requirements. Groundwater may be a viable option; however, no active wells exist in the vicinity of the construction site. The effects of water on properties of concrete should be investigated during production of mix design trials.

CONSTRUCTION METHODOLOGY

The construction methodology is standard dam construction.

The site needs to be dewatered because Deer Creek runs through the dam location. A small upstream, earth dike will divert water into a pipe, which becomes a part of the outlet works.

UNUSUAL CONDITIONS (Soil, Water, Weather)
No unusual conditions occur at the site.

UNIQUE TECHNIQUES OF CONSTRUCTION
No unique technique construction will need to be accomplished.

EQUIPMENT AND LABOR AVAILABILITY & DISTANCE TRAVELED
This estimate uses Davis Bacon labor rates for Lewis County, revision number 11, dated 2/32/99. See the labor spread sheet for development of labor costs used in the estimate.
Equipment rates used are from EP 1110-1-8, Volume 3, September 1997.

ENVIRONMENTAL CONCERNS
This estimate has provisions for Monthly Anticipated Adverse Weather Delays as specified in the contract clauses.

This estimate acknowledges no amendments at this time.

This work will not be performed by a contractor under the Small Business Administration 8a program.

Prices are good for the period May 1999 through October 1999. Total project costs summary spreadsheet will take care of inflation after that.
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SUMMARY REPORTS | SUMMARY PAGE

No Detailed Estimate...

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC DEER CREEK EARTH DAM & ROADS										
AC-03 RESERVOIRS										
AC-03.1 RESERVOIRS										
AC-03.1.3 CLEARING AND DEBRIS REMOVAL	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
AC-04 DAMS (COMPACTED EARTH FILL)										
AC-04.1 MAIN DAM										
AC-04.1.A MOB., DEMOB., AND PREWORK			127,625	19,144	5,871	10,685	2,450	3,315	169,090	
AC-04.1.C SITE ACCESS ROADS & PARKING			110,459	16,569	5,081	9,248	2,120	2,870	146,347	
AC-04.1.D EARTHWORK FOR STRUCTURES	6400.00	CY	33,501	5,025	1,541	2,805	643	870	44,385	6.94
AC-04.1.E FOUNDATION WORK	20000	SF	263,617	39,543	12,126	22,070	5,060	6,848	349,264	17.46
AC-04.1.S COMPACTED EARTH DAM	214000	CY	1442960	216,444	66,376	120,805	27,699	37,486	1911770	8.93
TOTAL MAIN DAM	214000	CY	1978162	296,724	90,995	165,612	37,972	51,389	2620856	12.25
AC-04.2 SPILLWAY										
AC-04.2.9 EARTHWORK FOR STRUCTURES			155,144	23,272	7,137	12,989	2,978	4,030	205,550	
AC-04.2.A FOUNDATION WORK			2,162	324	99	181	41	56	2,864	
AC-04.2.F CONCRETE OVERFLOW SECTION			90,500	13,575	4,163	7,577	1,737	2,351	119,903	
TOTAL SPILLWAY	1.00	EA	247,806	37,171	11,399	20,746	4,757	6,438	328,316	328316
AC-04.3 OUTLET WORKS										
AC-04.3.1 APPROACH AND OUTLET CHANNELS	1.00	EA	20,526	3,079	944	1,718	394	533	27,195	27195
AC-04.3.3 CONDUIT OR TUNNEL	440.00	LF	147,991	22,199	6,808	12,390	2,841	3,845	196,072	445.62
AC-04.3.4 INTAKE STRUCTURE	45.00	VLF	146,221	21,933	6,726	12,242	2,807	3,799	193,727	4305.05
TOTAL OUTLET WORKS	92.00	LF	314,738	47,211	14,478	26,350	6,042	8,176	416,994	4532.54
TOTAL DAMS (COMPACTED EARTH FILL)	214000	CY	2540706	381,106	116,872	212,708	48,771	66,003	3366166	15.73
AC-08 ROADS, RAILROADS, AND BRIDGES										
AC-08.1 ROADS										

		QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-08.1.B	FOREST ROAD, IMPROVE EXISTING(A)	36600 LF	456,943	68,541	33,286	39,114	8,968	12,137	618,989	16.91
AC-08.1.C	NEW PERM SITE ACCESS ROADS (B)	1050.00 LF	56,383	8,457	4,438	4,849	1,112	1,505	76,744	73.09
AC-08.1.D	NEW PERM-TO-TOP OF DAM A-ROAD(C)	1735.00 LF	57,403	8,610	4,460	4,933	1,131	1,531	78,068	45.00
	TOTAL ROADS	45301 LF	570,728	85,609	42,184	48,897	11,211	15,173	773,802	17.08
	TOTAL ROADS, RAILROADS, AND BRIDGES	8.58 MI	570,728	85,609	42,184	48,897	11,211	15,173	773,802	90190
	TOTAL DEER CREEK EARTH DAM & ROADS		3198983	475,470	165,798	268,818	61,636	83,414	4254119	

		QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC	DEER CREEK EARTH DAM & ROADS										
AC-03	RESERVOIRS										
AC-03.1	RESERVOIRS										
AC-03.1.3	CLEARING AND DEBRIS REMOVAL										
AC-03.1.3-01-	CLEARING AND DEBRIS REMOVAL										
AC-03.1.3-01--02AB	Clear, Grubb,Hvy Brush&Lgh Trees	11.00	ACR	44,830	4,483	3,452	3,694	847	1,146	58,451	5313.76
AC-03.1.3-01--02AD	Clr,H-Brush W/Avg Grub,M/H-Trees	100.00	ACR	42,719	4,272	3,289	3,520	807	1,092	55,699	556.99
	TOTAL CLEARING AND DEBRIS REMOVAL	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
	TOTAL CLEARING AND DEBRIS REMOVAL	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
	TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
	TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
AC-04	DAMS (COMPACTED EARTH FILL)										
AC-04.1	MAIN DAM										
AC-04.1.A	MOB., DEMOB., AND PREWORK										
AC-04.1.A-01-	MOB., DEMOB., AND PREWORK										
AC-04.1.A-01--AA	Prime Contractor Mob.			48,192	7,229	2,217	4,035	925	1,252	63,850	
AC-04.1.A-01--AB	Prime Contractor Demob			17,518	2,628	806	1,467	336	455	23,209	
AC-04.1.A-01--BA	Nx-Exploratory Mob & Demob			1,970	295	91	165	38	51	2,609	
AC-04.1.A-01--BD	Blasting Subcontractor			3,105	466	143	260	60	81	4,114	
AC-04.1.A-01--BE	Fencing Subcontractor			1,846	277	85	155	35	48	2,446	
AC-04.1.A-01--CA	Shotcrete Mob & Demob	2.00	TRP	1,906	286	88	160	37	50	2,525	1262.46
AC-04.1.A-01--CB	Concrete Batch Plant			25,850	3,877	1,189	2,164	496	672	34,248	
AC-04.1.A-01--CD	Crushing Plant			12,513	1,877	576	1,048	240	325	16,579	
	TOTAL MOB., DEMOB., AND PREWORK			112,900	16,935	5,193	9,452	2,167	2,933	149,580	
AC-04.1.A-02-	DIVERSION AND CARE OF WATER										
AC-04.1.A-02--02AA	Diversion Conduit 48" Dia CMP	50.00	LF	4,498	675	207	377	86	117	5,959	119.18
AC-04.1.A-02--02BA	Diversion Conduit Upper Dike	1800.00	CY	1,074	161	49	90	21	28	1,423	0.79
AC-04.1.A-02--02JA	Dr Conduit Connect to Inlet Str	1.00	EA	0	0	0	0	0	0	0	0.01
AC-04.1.A-02--02KA	Remove D Conduit 48" Dia CMP	50.00	LF	758	114	35	63	15	20	1,004	20.08
AC-04.1.A-02--02LA	Remove Diversion Upper Dike	1800.00	CY	2,445	367	112	205	47	64	3,239	1.80

	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
TOTAL DIVERSION AND CARE OF WATER	240.00	LF	8,774	1,316	404	735	168	228	11,624	48.44
AC-04.1.A-03- STORAGE &PONDING OF CONSTR WATER										
AC-04.1.A-03--02AA Diversion Conduit 48" Dia CMP	20.00	LF	1,732	260	80	145	33	45	2,294	114.72
AC-04.1.A-03--02BA Diversion Conduit Upper Dike	1800.00	CY	1,601	240	74	134	31	42	2,122	1.18
AC-04.1.A-03--02KA Remove D Conduit 48" Dia CMP	20.00	LF	303	45	14	25	6	8	402	20.08
AC-04.1.A-03--02LA Remove Diversion Upper Dike	1800.00	CY	2,315	347	106	194	44	60	3,067	1.70
TOTAL STORAGE &PONDING OF CONSTR WATER	1.00	EA	5,951	893	274	498	114	155	7,885	7885.02
TOTAL MOB., DEMOB., AND PREWORK			127,625	19,144	5,871	10,685	2,450	3,315	169,090	
AC-04.1.C SITE ACCESS ROADS & PARKING										
AC-04.1.C-03- SITE FENCING										
AC-04.1.C-03--02BA 6' Site Fencing	630.00	LF	14,964	2,245	688	1,253	287	389	19,826	31.47
AC-04.1.C-03--02BC 6' Site Fencing Gates	3.00	EA	3,761	564	173	315	72	98	4,983	1660.92
TOTAL SITE FENCING	630.00	LF	18,725	2,809	861	1,568	359	486	24,809	39.38
AC-04.1.C-04- DECK GUARD RAIL										
AC-04.1.C-04--02AA Guardrail,S-Rail, Wood Posts	1300.00	LF	58,740	8,811	2,702	4,918	1,128	1,526	77,824	59.86
AC-04.1.C-04--02AB Guardrail,S-Rail, Wood Post,Ends	8.00	EA	1,482	222	68	124	28	38	1,963	245.36
TOTAL DECK GUARD RAIL	1300.00	LF	60,222	9,033	2,770	5,042	1,156	1,564	79,787	61.37
AC-04.1.C-05- DRYLAND GRASS ESTABLISHMENT										
AC-04.1.C-05--02BA Dryland Grass Establishment	3.00	ACR	6,300	945	290	527	121	164	8,347	2782.28
TOTAL DRYLAND GRASS ESTABLISHMENT	3.00	ACR	6,300	945	290	527	121	164	8,347	2782.28
AC-04.1.C-06- CULVERTS - 18 INCH (1 EACH)										
AC-04.1.C-06--02AA Culverts - Excavation	7.00	CY	192	29	9	16	4	5	255	36.42
AC-04.1.C-06--02BA Culverts - 18 Inch CMP	20.00	LF	460	69	21	39	9	12	610	30.50
AC-04.1.C-06--02CA Culverts - Backfill Bedding	5.00	CY	539	81	25	45	10	14	715	142.95
TOTAL CULVERTS - 18 INCH (1 EACH)	20.00	LF	1,192	179	55	100	23	31	1,580	78.98
AC-04.1.C-11- TRILATERATION SURVEY										

U.S. Army Corps of Engineers
PROJECT DEERE2: DEER CREEK EARTH DAM & ROADS - Near Winchester, Northern Idaho
EARTH DAM FOR DEER CREEK, BUDGET ESTIMATE
** PROJECT INDIRECT SUMMARY - IND CODE **

		QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.C-11--02BA	Trilateration Caps on Rock	2.00	EA	484	73	22	41	9	13	641	320.58
AC-04.1.C-11--02BB	Trilateration Caps in Soil	1.00	EA	407	61	19	34	8	11	539	538.74
AC-04.1.C-11--02BC	Survey Markers on Earth Dam	7.00	EA	2,846	427	131	238	55	74	3,771	538.74
AC-04.1.C-11--02BD	Survey (Trilateration Survey)	4.00	DAY	1,978	297	91	166	38	51	2,621	655.13
	TOTAL TRILATERATION SURVEY	3.00	EA	5,715	857	263	478	110	148	7,572	2523.85
AC-04.1.C-12-	SITE ACCESS & HAUL ROADS										
AC-04.1.C-12--02DA	Constr Road D1,Grade Road Bed12w	1751.00	SY	1,729	259	80	145	33	45	2,290	1.31
AC-04.1.C-12--02DC	Constr Road D2,Grade Road Bed20w	2920.00	SY	2,883	432	133	241	55	75	3,819	1.31
AC-04.1.C-12--02EA	Constr Road E,Grade Road Bed 12w	1390.00	SY	1,372	206	63	115	26	36	1,818	1.31
AC-04.1.C-12--02FA	Constr Road F,Grade Road Bed 12w	800.00	SY	790	118	36	66	15	21	1,046	1.31
AC-04.1.C-12--02GA	Constr Road G,Grade Road Bed 12w	630.00	SY	622	93	29	52	12	16	824	1.31
AC-04.1.C-12--02HA	Constr Road H,Grade Road Bed 20w	2333.00	SY	2,303	345	106	193	44	60	3,051	1.31
	TOTAL SITE ACCESS & HAUL ROADS	45250	LF	9,698	1,455	446	812	186	252	12,849	0.28
AC-04.1.C-13-	D-FACE ROAD,CRUSHD SURFACING MAT										
AC-04.1.C-13--02BA	Produce Surface Materials Dr&Bl	233.00	BCY	839	126	39	70	16	22	1,112	4.77
AC-04.1.C-13--02BB	Crushing & Stockpile Materials	209.00	LCY	1,011	152	46	85	19	26	1,339	6.41
	TOTAL D-FACE ROAD,CRUSHD SURFACING MAT	155.00	CY	1,850	277	85	155	36	48	2,451	15.81
AC-04.1.C-14-	D-FACE ROAD, PREP FOR SURFACING										
AC-04.1.C-14--02AA	Forest Roads, Grade Road Bed	930.00	SY	732	110	34	61	14	19	969	1.04
	TOTAL D-FACE ROAD, PREP FOR SURFACING	695.00	LF	732	110	34	61	14	19	969	1.39
AC-04.1.C-15-	D-FACE ROAD, 4" BASE COURSE										
AC-04.1.C-15--02BC	Load, Haul & Place Base Course	930.00	BCY	4,519	678	208	378	87	117	5,988	6.44
	TOTAL D-FACE ROAD, 4" BASE COURSE	930.00	SY	4,519	678	208	378	87	117	5,988	6.44
AC-04.1.C-16-	D-FACE ROAD, 2" TOP COURSE										
AC-04.1.C-16--02BC	Load, Haul & Place Top Course	465.00	BCY	1,506	226	69	126	29	39	1,996	4.29
	TOTAL D-FACE ROAD, 2" TOP COURSE	930.00	SY	1,506	226	69	126	29	39	1,996	2.15
	TOTAL SITE ACCESS ROADS & PARKING			110,459	16,569	5,081	9,248	2,120	2,870	146,347	

	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.D EARTHWORK FOR STRUCTURES										
AC-04.1.D-12A EXCAVATION,UNCLASF										
AC-04.1.D-12A-02AA Excavation and Strip Foundation	1945.00	SY	10,238	1,536	471	857	197	266	13,564	6.97
AC-04.1.D-12A-02BA Excavation and Haul Common	5200.00	BCY	13,297	1,995	612	1,113	255	345	17,617	3.39
AC-04.1.D-12A-02BC Rip Rock	300.00	BCY	1,419	213	65	119	27	37	1,880	6.27
AC-04.1.D-12A-02BD Blast Boulders	18.00	BCY	1,020	153	47	85	20	27	1,352	75.11
AC-04.1.D-12A-02BE Load & Haul Ripped &Blasted Rock	300.00	BCY	819	123	38	69	16	21	1,084	3.61
AC-04.1.D-12A-02BF Maintain Haul Roads	5500.00	BCY	6,707	1,006	309	562	129	174	8,886	1.62
TOTAL EXCAVATION,UNCLASF	5500.00	CY	33,501	5,025	1,541	2,805	643	870	44,385	8.07
TOTAL EARTHWORK FOR STRUCTURES	6400.00	CY	33,501	5,025	1,541	2,805	643	870	44,385	6.94
AC-04.1.E FOUNDATION WORK										
AC-04.1.E-16A EXPLORATORY DRILLING										
AC-04.1.E-16A-02BA Nx Exploratory Drilling	200.00	LF	17,938	2,691	825	1,502	344	466	23,766	118.83
TOTAL EXPLORATORY DRILLING	200.00	LF	17,938	2,691	825	1,502	344	466	23,766	118.83
AC-04.1.E-17A PRESURE TESTING NX HOLE										
AC-04.1.E-17A-02BA Presure Testing NX Hole	200.00	MIN	1,600	240	74	134	31	42	2,120	10.60
TOTAL PRESURE TESTING NX HOLE	200.00	MIN	1,600	240	74	134	31	42	2,120	10.60
AC-04.1.E-19A FOUNDATION CLEANUP										
AC-04.1.E-19A-02BA Foundation Cleanup	4240.00	SY	55,055	8,258	2,533	4,609	1,057	1,430	72,942	17.20
TOTAL FOUNDATION CLEANUP	4240.00	SY	55,055	8,258	2,533	4,609	1,057	1,430	72,942	17.20
AC-04.1.E-22A FOUND.TREAT.DRILL GROUT CURTAIN										
AC-04.1.E-22A-02BA Drill Foundation Grout Curtain	6400.00	LF	73,035	10,955	3,360	6,114	1,402	1,897	96,763	15.12
TOTAL FOUND.TREAT.DRILL GROUT CURTAIN	6400.00	LF	73,035	10,955	3,360	6,114	1,402	1,897	96,763	15.12
AC-04.1.E-23A FOUND.TREAT.DRILL HOLE SETUPS										
AC-04.1.E-23A-03AA Grout Holes Setups	240.00	EA	23,810	3,571	1,095	1,993	457	619	31,546	131.44
TOTAL FOUND.TREAT.DRILL HOLE SETUPS	240.00	EA	23,810	3,571	1,095	1,993	457	619	31,546	131.44

	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.E-24A FOUND.TREAT.WATER PRESSURE TESTG										
AC-04.1.E-24A-03BA Water Pressure Testing	240.00	EA	18,726	2,809	861	1,568	359	486	24,809	103.37
TOTAL FOUND.TREAT.WATER PRESSURE TESTG	240.00	EA	18,726	2,809	861	1,568	359	486	24,809	103.37
AC-04.1.E-25A FOUND.TREAT.GROUT QUANTITIES										
AC-04.1.E-25A-03AA Cement Grout HRWRA Admixture	720.00	GAL	13,305	1,996	612	1,114	255	346	17,627	24.48
AC-04.1.E-25A-03CA Cement Bulk Grout	4515.00	CWT	25,668	3,850	1,181	2,149	493	667	34,007	7.53
TOTAL FOUND.TREAT.GROUT QUANTITIES	4515.00	CWT	38,972	5,846	1,793	3,263	748	1,012	51,634	11.44
AC-04.1.E-26- DENTAL CONCRETE										
AC-04.1.E-26--03CA Dental Concrete	200.00	CY	34,481	5,172	1,586	2,887	662	896	45,683	228.42
TOTAL DENTAL CONCRETE	200.00	CY	34,481	5,172	1,586	2,887	662	896	45,683	228.42
TOTAL FOUNDATION WORK	20000	SF	263,617	39,543	12,126	22,070	5,060	6,848	349,264	17.46
AC-04.1.S COMPACTED EARTH DAM										
AC-04.1.S-23A IMPERVIOUS CORE MATERIAL (CH)										
AC-04.1.S-23A-02BA Load, Haul, Place Impervious Mat	179900	CY	825,289	123,793	37,963	69,093	15,842	21,440	1093420	6.08
TOTAL IMPERVIOUS CORE MATERIAL (CH)	179900	CY	825,289	123,793	37,963	69,093	15,842	21,440	1093420	6.08
AC-04.1.S-24- SAND FILTER, (10' THICK)										
AC-04.1.S-24--02AC Crushing & Stockpile Materials	20925	LCY	102,239	15,336	4,703	8,559	1,963	2,656	135,456	6.47
AC-04.1.S-24--02BA Load, Haul & Place Sand Filter	15500	BCY	141,299	21,195	6,500	11,830	2,712	3,671	187,206	12.08
TOTAL SAND FILTER, (10' THICK)	15500	CY	243,538	36,531	11,203	20,389	4,675	6,327	322,662	20.82
AC-04.1.S-25- COBBLE BEDDING,(9" THICK GRAVEL)										
AC-04.1.S-25--02AC Crushing & Stockpile Materials	2606.00	LCY	12,733	1,910	586	1,066	244	331	16,870	6.47
AC-04.1.S-25--02BA Load, Haul & Place Gravel Filter	15500	BCY	87,338	13,101	4,018	7,312	1,677	2,269	115,714	7.47
TOTAL COBBLE BEDDING,(9" THICK GRAVEL)	1930.00	CY	100,071	15,011	4,603	8,378	1,921	2,600	132,584	68.70
AC-04.1.S-26- COBBLE 18"THICK SLOPE PROTECTION										

		QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.S-26--02AC	Crushing & Stockpile Materials	5576.00	LCY	27,244	4,087	1,253	2,281	523	708	36,096	6.47
AC-04.1.S-26--02BA	Load,Haul & Dumping Cobble Rocks	4130.00	BCY	17,716	2,657	815	1,483	340	460	23,472	5.68
AC-04.1.S-26--02CA	Placing and Keying in Cobbles	4130.00	BCY	6,048	907	278	506	116	157	8,013	1.94
	TOTAL COBBLE 18"THICK SLOPE PROTECTION	4130.00	CY	51,008	7,651	2,346	4,270	979	1,325	67,581	16.36
AC-04.1.S-27-	RIPRAP BEDDING,(12"THICK GRAVEL)										
AC-04.1.S-27--02AC	Crushing & Stockpile Materials	4752.00	LCY	23,218	3,483	1,068	1,944	446	603	30,762	6.47
AC-04.1.S-27--02BA	Load,Haul & Place Riprap Bedding	3520.00	BCY	15,058	2,259	693	1,261	289	391	19,951	5.67
	TOTAL RIPRAP BEDDING,(12"THICK GRAVEL)	3520.00	CY	38,276	5,741	1,761	3,205	735	994	50,712	14.41
AC-04.1.S-28-	RIPRAP 30"THICK SLOPE PROTECTION										
AC-04.1.S-28--02AC	Crushing & Stockpile Materials	18040	LCY	88,143	13,221	4,055	7,379	1,692	2,290	116,780	6.47
AC-04.1.S-28--02BA	Load, Haul & Dumping Riprap	9020.00	BCY	82,379	12,357	3,789	6,897	1,581	2,140	109,143	12.10
AC-04.1.S-28--02CA	Placing and Keying in Riprap	9020.00	BCY	14,257	2,138	656	1,194	274	370	18,888	2.09
	TOTAL RIPRAP 30"THICK SLOPE PROTECTION	9020.00	CY	184,778	27,717	8,500	15,470	3,547	4,800	244,812	27.14
	TOTAL COMPACTED EARTH DAM	214000	CY	1442960	216,444	66,376	120,805	27,699	37,486	1911770	8.93
	TOTAL MAIN DAM	214000	CY	1978162	296,724	90,995	165,612	37,972	51,389	2620856	12.25
AC-04.2	SPILLWAY										
AC-04.2.9	EARTHWORK FOR STRUCTURES										
AC-04.2.9-11A	EXCAVATION,UNCLASF										
AC-04.2.9-11A-02AA	Excavation and Strip Foundation	5220.00	SY	27,477	4,122	1,264	2,300	527	714	36,404	6.97
AC-04.2.9-11A-02BA	Excavation and Haul Common	5080.00	BCY	15,588	2,338	717	1,305	299	405	20,653	4.07
AC-04.2.9-11A-02BB	Excavation and Trim Common	1000.00	BCY	1,540	231	71	129	30	40	2,040	2.04
AC-04.2.9-11A-02BC	Rip Rock	300.00	BCY	1,419	213	65	119	27	37	1,880	6.27
AC-04.2.9-11A-02BD	Blast Boulders	12.00	BCY	680	102	31	57	13	18	901	75.11
AC-04.2.9-11A-02BE	Load & Haul Ripped &Blasted Rock	300.00	BCY	819	123	38	69	16	21	1,084	3.61
	TOTAL EXCAVATION,UNCLASF	3700.00	CY	47,523	7,128	2,186	3,979	912	1,235	62,963	17.02
AC-04.2.9-12A	EXCAVATION,ROCK EXCAVATION										
AC-04.2.9-12A-02BA	Rock, Drill, Shot & Producing	9120.00	CY	50,692	7,604	2,332	4,244	973	1,317	67,162	7.36
AC-04.2.9-12A-02BC	Presplit Rock, Drill, & Shot	1400.00	LF	30,591	4,589	1,407	2,561	587	795	40,529	28.95
AC-04.2.9-12A-02BE	Load & Haul Ripped &Blasted Rock	9120.00	BCY	26,338	3,951	1,212	2,205	506	684	34,895	3.83

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
TOTAL EXCAVATION,ROCK EXCAVATION	9120.00 CY	107,621	16,143	4,951	9,010	2,066	2,796	142,587	15.63
TOTAL EARTHWORK FOR STRUCTURES		155,144	23,272	7,137	12,989	2,978	4,030	205,550	
AC-04.2.A FOUNDATION WORK									
AC-04.2.A-19A FOUNDATION CLEANUP									
AC-04.2.A-19A-02BA Foundation Cleanup	150.00 SY	2,162	324	99	181	41	56	2,864	19.09
TOTAL FOUNDATION CLEANUP	150.00 SY	2,162	324	99	181	41	56	2,864	19.09
TOTAL FOUNDATION WORK		2,162	324	99	181	41	56	2,864	
AC-04.2.F CONCRETE OVERFLOW SECTION									
AC-04.2.F-20- CONCRETE OVERFLOW SECTION									
AC-04.2.F-20--03CA Concrete Overflow Section	245.00 CY	45,711	6,857	2,103	3,827	877	1,187	60,562	247.19
AC-04.2.F-20--03DA Concrete Retaining Walls' Slabs	33.00 CY	10,180	1,527	468	852	195	264	13,488	408.72
AC-04.2.F-20--03DD Concrete Retaining Walls	100.00 CY	34,609	5,191	1,592	2,897	664	899	45,853	458.53
TOTAL CONCRETE OVERFLOW SECTION	355.00 CY	90,500	13,575	4,163	7,577	1,737	2,351	119,903	337.75
TOTAL CONCRETE OVERFLOW SECTION		90,500	13,575	4,163	7,577	1,737	2,351	119,903	
TOTAL SPILLWAY	1.00 EA	247,806	37,171	11,399	20,746	4,757	6,438	328,316	328316
AC-04.3 OUTLET WORKS									
AC-04.3.1 APPROACH AND OUTLET CHANNELS									
AC-04.3.1-35- CONCRETE OUTLET&IMPACT BASIN STR									
AC-04.3.1-35--02BG Outlet Channel Rip Rap,20" Thick	100.00 ECY	9,155	1,373	421	766	176	238	12,130	121.30
AC-04.3.1-35--03CC Concr.Impact Basin Slab	5.00 CY	1,591	239	73	133	31	41	2,108	421.56
AC-04.3.1-35--03CD Concr.Impact Basin Wall & Baffle	15.00 CY	8,837	1,326	407	740	170	230	11,708	780.56
AC-04.3.1-35--03CE Concr.Impact Basin Precast Slab	2.00 CY	942	141	43	79	18	24	1,249	624.29
TOTAL CONCRETE OUTLET&IMPACT BASIN STR	1.00 EA	20,526	3,079	944	1,718	394	533	27,195	27195
TOTAL APPROACH AND OUTLET CHANNELS	1.00 EA	20,526	3,079	944	1,718	394	533	27,195	27195
AC-04.3.3 CONDUIT OR TUNNEL									
AC-04.3.3-33- OUTLET CONDUIT (48" DIA. PIPE)									

	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.3.3-33--02QA Outlet Conduit (48" Dia. Pipe)	440.00	LF	81,022	12,153	3,727	6,783	1,555	2,105	107,345	243.97
TOTAL OUTLET CONDUIT (48" DIA. PIPE)	440.00	LF	81,022	12,153	3,727	6,783	1,555	2,105	107,345	243.97
AC-04.3.3-34A OUTLET CONDUIT CONCRETE										
AC-04.3.3-34A-03CA Outlet Conduit Concrete	396.00	CY	66,969	10,045	3,081	5,607	1,286	1,740	88,727	224.06
TOTAL OUTLET CONDUIT CONCRETE	396.00	CY	66,969	10,045	3,081	5,607	1,286	1,740	88,727	224.06
TOTAL CONDUIT OR TUNNEL	440.00	LF	147,991	22,199	6,808	12,390	2,841	3,845	196,072	445.62
AC-04.3.4 INTAKE STRUCTURE										
AC-04.3.4-32- INTAKE STRUCTURE										
AC-04.3.4-32--02CA Intake Tower Foundation Slab	16.00	CY	3,357	504	154	281	64	87	4,447	277.96
AC-04.3.4-32--03CB Intake Tower Walls	15.00	CY	9,659	1,449	444	809	185	251	12,798	853.18
AC-04.3.4-32--03CC Intake Tower Elevated Slab	2.00	CY	1,801	270	83	151	35	47	2,386	1193.07
AC-04.3.4-32--03CD Intake Gate Controller Slab	50.00	CY	12,485	1,873	574	1,045	240	324	16,541	330.83
AC-04.3.4-32--05AB Intake Tower Control Room	200.00	SF	4,000	600	184	335	77	104	5,300	26.50
AC-04.3.4-32--05EB Intake Tower Trashracks	1770.00	LB	6,698	1,005	308	561	129	174	8,875	5.01
AC-04.3.4-32--15QA 24"x 24" Slide Gate & Controller	2.00	EA	105,806	15,871	4,867	8,858	2,031	2,749	140,182	70091
AC-04.3.4-32--15QB 12" Dia. Vent Pipe	220.00	LF	2,414	362	111	202	46	63	3,199	14.54
TOTAL INTAKE STRUCTURE	45.00	VLF	146,221	21,933	6,726	12,242	2,807	3,799	193,727	4305.05
TOTAL INTAKE STRUCTURE	45.00	VLF	146,221	21,933	6,726	12,242	2,807	3,799	193,727	4305.05
TOTAL OUTLET WORKS	92.00	LF	314,738	47,211	14,478	26,350	6,042	8,176	416,994	4532.54
TOTAL DAMS (COMPACTED EARTH FILL)	214000	CY	2540706	381,106	116,872	212,708	48,771	66,003	3366166	15.73
AC-08 ROADS, RAILROADS, AND BRIDGES										
AC-08.1 ROADS										
AC-08.1.B FOREST ROAD, IMPROVE EXISTING(A)										
AC-08.1.B-02- FOREST ROAD,CRUSHD SURFACING MAT										
AC-08.1.B-02--02BA Produce Surface Materials Dr&Bl	12750	BCY	45,911	6,887	2,112	3,844	881	1,193	60,827	4.77
AC-08.1.B-02--02BB Crushing & Stockpile Materials	11475	LCY	55,486	8,323	2,552	4,645	1,065	1,441	73,513	6.41
TOTAL FOREST ROAD,CRUSHD SURFACING MAT	8500.00	CY	101,397	15,210	4,664	8,489	1,946	2,634	134,340	15.80
AC-08.1.B-03- FOREST ROAD, PREP FOR SURFACING										

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-08.1.B-03--02AA Forest Roads, Grade Road Bed	48850 SY	38,437	5,765	3,094	3,311	759	1,027	52,393	1.07
TOTAL FOREST ROAD, PREP FOR SURFACING	36600 LF	38,437	5,765	3,094	3,311	759	1,027	52,393	1.43
AC-08.1.B-04- FOREST ROAD, 4" BASE COURSE									
AC-08.1.B-04--02BC Load, Haul & Place Base Course	49050 BCY	211,657	31,749	17,038	18,231	4,180	5,657	288,513	5.88
TOTAL FOREST ROAD, 4" BASE COURSE	49050 SY	211,657	31,749	17,038	18,231	4,180	5,657	288,513	5.88
AC-08.1.B-05- FOREST ROAD, 2" TOP COURSE									
AC-08.1.B-05--02BC Load, Haul & Place Top Course	24525 BCY	105,452	15,818	8,489	9,083	2,083	2,818	143,743	5.86
TOTAL FOREST ROAD, 2" TOP COURSE	49050 SY	105,452	15,818	8,489	9,083	2,083	2,818	143,743	2.93
TOTAL FOREST ROAD, IMPROVE EXISTING(A)	36600 LF	456,943	68,541	33,286	39,114	8,968	12,137	618,989	16.91
AC-08.1.C NEW PERM SITE ACCESS ROADS (B)									
AC-08.1.C-06- ACCESS ROAD,CRUSHD SURFACING MAT									
AC-08.1.C-06--02BA Produce Surface Materials Dr&Bl	368.00 BCY	1,325	199	61	111	25	34	1,756	4.77
AC-08.1.C-06--02BB Crushing & Stockpile Materials	331.00 LCY	1,601	240	74	134	31	42	2,121	6.41
TOTAL ACCESS ROAD,CRUSHD SURFACING MAT	245.00 CY	2,926	439	135	245	56	76	3,876	15.82
AC-08.1.C-07- ACCESS ROAD, PREP FOR SURFACING									
AC-08.1.C-07--02AA Forest Roads, Grade Road Bed	48850 SY	38,437	5,765	3,094	3,311	759	1,027	52,393	1.07
TOTAL ACCESS ROAD, PREP FOR SURFACING	1050.00 LF	38,437	5,765	3,094	3,311	759	1,027	52,393	49.90
AC-08.1.C-08- ACCESS ROAD, 4" BASE COURSE									
AC-08.1.C-08--02BC Load, Haul & Place Base Course	1400.00 BCY	6,026	904	485	519	119	161	8,214	5.87
TOTAL ACCESS ROAD, 4" BASE COURSE	1400.00 SY	6,026	904	485	519	119	161	8,214	5.87
AC-08.1.C-09- ACCESS ROAD, 2" TOP COURSE									
AC-08.1.C-09--02BC Load, Haul & Place Top Course	700.00 BCY	3,013	452	243	260	60	81	4,107	5.87
TOTAL ACCESS ROAD, 2" TOP COURSE	1400.00 SY	3,013	452	243	260	60	81	4,107	2.93

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-08.1.C-10- ACCESS ROAD,CULVERTS-18"(5 EACH)									
AC-08.1.C-10--02AA Culverts - Excavation	34.00 CY	750	113	60	65	15	20	1,023	30.08
AC-08.1.C-10--02BA Culverts - 18 Inch CMP	100.00 LF	2,302	345	185	198	45	62	3,138	31.38
AC-08.1.C-10--02CA Culverts - Backfill Bedding	27.00 CY	2,929	439	236	252	58	78	3,993	147.88
TOTAL ACCESS ROAD,CULVERTS-18"(5 EACH)	100.00 LF	5,982	897	482	515	118	160	8,154	81.54
TOTAL NEW PERM SITE ACCESS ROADS (B)	1050.00 LF	56,383	8,457	4,438	4,849	1,112	1,505	76,744	73.09
AC-08.1.D NEW PERM-TO-TOP OF DAM A-ROAD(C)									
AC-08.1.D-06- ACCESS ROAD,CRUSHD SURFACING MAT									
AC-08.1.D-06--02BA Produce Surface Materials Dr&Bl	585.00 BCY	2,107	316	97	176	40	55	2,791	4.77
AC-08.1.D-06--02BB Crushing & Stockpile Materials	527.00 LCY	2,548	382	117	213	49	66	3,376	6.41
TOTAL ACCESS ROAD,CRUSHD SURFACING MAT	390.00 CY	4,655	698	214	390	89	121	6,167	15.81
AC-08.1.D-07- ACCESS ROAD, PREP FOR SURFACING									
AC-08.1.D-07--02AA Forest Roads, Grade Road Bed	48850 SY	38,437	5,765	3,094	3,311	759	1,027	52,393	1.07
TOTAL ACCESS ROAD, PREP FOR SURFACING	1735.00 LF	38,437	5,765	3,094	3,311	759	1,027	52,393	30.20
AC-08.1.D-08- ACCESS ROAD, 4" BASE COURSE									
AC-08.1.D-08--02BC Load, Haul & Place Base Course	2320.00 BCY	9,792	1,469	788	843	193	262	13,348	5.75
TOTAL ACCESS ROAD, 4" BASE COURSE	2320.00 SY	9,792	1,469	788	843	193	262	13,348	5.75
AC-08.1.D-09- ACCESS ROAD, 2" TOP COURSE									
AC-08.1.D-09--02BC Load, Haul & Place Top Course	1160.00 BCY	4,519	678	364	389	89	121	6,160	5.31
TOTAL ACCESS ROAD, 2" TOP COURSE	2320.00 SY	4,519	678	364	389	89	121	6,160	2.66
TOTAL NEW PERM-TO-TOP OF DAM A-ROAD(C)	1735.00 LF	57,403	8,610	4,460	4,933	1,131	1,531	78,068	45.00
TOTAL ROADS	45301 LF	570,728	85,609	42,184	48,897	11,211	15,173	773,802	17.08
TOTAL ROADS, RAILROADS, AND BRIDGES	8.58 MI	570,728	85,609	42,184	48,897	11,211	15,173	773,802	90190
TOTAL DEER CREEK EARTH DAM & ROADS		3198983	475,470	165,798	268,818	61,636	83,414	4254119	

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, RCC DAM AND ACCESS ROADS
LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO

DISTRICT: WALLA WALLA
P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

		CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 EFFECTIVE PRICING LEVEL: 1 OCT 99				AUTHORIZ./BUDGET YEAR: 1999 EFFECT. PRICING LEVEL: 1 OCT 99			........FULLY FUNDED ESTIMATE.........			
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	SPENT THRU FY 99 ($K)	COST ($K)	CNTG ($K)	FULL ($K)
03.--	RESERVOIRS	114	23	20%	137	117	23	140		126	25	151
04.--	DAM	3,517	703	20%	4,221	3,609	721	4,330		3,898	779	4,677
08.--	ACCESS ROAD	774	155	20%	929	795	159	954		837	167	1,004
	GOVERNMENT FURNISH SERVICES											
	TOTAL CONSTRUCTION COSTS =====:	4,406	881	20%	5,287	4,521	903	5,424		4,861	971	5,832
01---	LANDS AND DAMAGES											
18---	CULTURAL RESOURCES											
21---	RECONNAISSANCE STUDIES											
22---	FEASIBILITY STUDIES											
30---	PLANNING, ENGINEERING & DESIGN	532	108	20%	640	546	110	656		574	114	688
31---	CONSTRUCTION MANAGEMENT	28	6	21%	34	28	6	34		30	6	36
	TOTAL PROJECT COSTS ==========>	4,966	995	20%	5,961	5,095	1,019	6,114		5,465	1,091	**6,556**

THIS TPCS REFLECTS A PROJECT COST CHANGE OF $ ~~~ ~~~~~~ ~~~~~~~~

TOTAL FEDERAL COSTS ==============> 6,556
TOTAL NON-FEDERAL COSTS ==========>
THE MAXIMUM PROJECT COST IS =======> $ ~~~~~~~~ ~~~~~~~~

DISTRICT APPROVED:
DISTRICT APPROVED DATE: ___/_______/_______

_________________ CHIEF, COST ENGINEERING, Kim Callan

_________________ CHIEF, REAL ESTATE, Richard Carlton

_________________ CHIEF, PLANNING, Dennis Cannon

_________________ CHIEF, ENGINEERING, Surya Bhamidipaty

_________________ CHIEF, OPERATIONS, Wayne John

_________________ CHIEF, CONSTRUCTION, John Treadwell

_________________ CHIEF, CONTRACTING, Jackie Anderson

_________________ PROJECT MANAGER, Debbie Willis

_________________ CHIEF, PM-PB, George Veighey

_________________ DDE (PM), acting David Keller

DIVISION APPROVED:
DIVISION APPROVED DATE: ___/______/_______

_________________ CHIEF, COST ENGINEERING, Wally Brassfield

_________________ DIRECTOR, REAL ESTATE, Cynthia Brown

_________________ DIRECTOR OF PROGRAM MANAGEMENT, Mike White

_________________ DIRECTOR OF ENGINEERING & TECHNICAL SERVICES, Jim Crews

_________________ CHIEF, CIVIL PROGRAMS, Clyde Barnhill

NOTE: Valid only when completely signed.

Walla Walla District

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, RCC DAM AND ACCESS ROADS — DISTRICT: WALLA WALLA

LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO — P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

		CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 EFFECTIVE PRICING LEVEL: 1 OCT 99				AUTHORIZ./BUDGET YEAR: 1999 EFFECT. PRICING LEVEL: 1 OCT 98				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
03.--	RESERVOIRS	114	23	20%	137	2.6%	117	23	140	1 QTR 02	8.0%	126	25	151
	Deer Creek Reservoir - Approx. 111 Acres													
	LETTER REPORT dated, May 1999, to evaluated dam alternatives for the Deer Creek Site for Nez Perce Tribe.													
	TOTAL CONSTRUCTION COSTS =====:	114	23	20%	137		117	23	140			126	25	151
01---	LANDS AND DAMAGES													
22---	FEASIBILITY STUDIES													
30---	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 01	5.3%	1		1
1.0%	Planning & Environmental Compliance	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
5.0%	Engineering & Design	7	1	20%	8	2.6%	7	1	8	1 QTR 01	5.3%	7	1	8
1.0%	Engineering Tech Review & VE	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
1.0%	Contracting & Reprographics	2		20%	2	2.6%	2		2	1 QTR 01	5.3%	2		2
3.0%	Engineering During Construction	4	1	20%	5	2.6%	4	1	5	1 QTR 02	8.0%	4	1	5
31---	CONSTRUCTION MANAGEMENT													
7.0%	Construction Management	8	2	20%	10	2.6%	8	2	10	1 QTR 02	8.0%	9	2	11
0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 02	8.0%	1		1
	TOTAL COSTS =================>	141	27	19%	168		144	27	171			154	29	183
06.2--	GOVERNMENT FURNISH MATERIALS													
30---	PLANNING, ENGINEERING & DESIGN													
15.0%	Engineering & Design													
1.0%	Contracting & Reprographics													
	TOTAL GFS COSTS =====>													
	MISC COSTS FOR ALL PROJECTS													
18---	CULTURAL RESOURCES													
30---	ANOTHER MISC E & D COSTS													

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, RCC DAM AND ACCESS ROADS — DISTRICT: WALLA WALLA

LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO — P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

		CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 EFFECTIVE PRICING LEVEL: 1 OCT 99				AUTHORIZ./BUDGET YEAR: 1999 EFFECT. PRICING LEVEL: 1 OCT 98				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
04.--	DAM													
04.01	MAIN DAM	3,138	628	20%	3,766	2.6%	3,220	644	3,864	1 QTR 02	8.0%	3,478	696	4,174
04.02	SPILLWAY	197	39	20%	237	2.6%	202	40	242	1 QTR 02	8.0%	218	43	261
04.03	OUTLET WORKS	182	36	20%	219	2.6%	187	37	224	1 QTR 02	8.0%	202	40	242
	RCC Dam													
	LETTER REPORT dated, May 1999, to evaluated dam alternatives for the Deer Creek Site for Nez Perce Tribe.													
	TOTAL CONSTRUCTION COSTS =====:	3,517	703	20%	4,221		3,609	721	4,330			3,898	779	4,677
01---	LANDS AND DAMAGES													
22---	FEASIBILITY STUDIES													
30---	PLANNING, ENGINEERING & DESIGN													
0.8%	Project Management	27	6	20%	33	2.6%	28	6	34	1 QTR 01	5.3%	29	6	35
1.0%	Planning & Environmental Compliance	36	8	20%	44	2.6%	37	8	45	1 QTR 01	5.3%	39	8	47
5.0%	Engineering & Design	180	36	20%	216	2.6%	185	37	222	1 QTR 01	5.3%	195	39	234
1.0%	Engineering Tech Review & VE	36	8	20%	44	2.6%	37	8	45	1 QTR 01	5.3%	39	8	47
1.0%	Contracting & Reprographics	36	8	20%	44	2.6%	37	8	45	1 QTR 01	5.3%	39	8	47
3.0%	Engineering During Construction	105	20	20%	125	2.6%	108	21	129	1 QTR 02	8.0%	117	23	140
31---	CONSTRUCTION MANAGEMENT													
7.0%	Construction Management	8	2	20%	10	2.6%	8	2	10	1 QTR 02	8.0%	9	2	11
0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 02	8.0%	1		1
	TOTAL COSTS =================>	3,946	791	20%	4,738		4,050	811	4,861			4,366	873	5,239
06.2--	GOVERNMENT FURNISH MATERIALS													
30---	PLANNING, ENGINEERING & DESIGN													
15.0%	Engineering & Design													
1.0%	Contracting & Reprographics													
	TOTAL GFS COSTS =====>													

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT LETTER, DATED: 24 FEB 99

PROJECT: DEER CREEK RESERVOIR, RCC DAM AND ACCESS ROADS
LOCATION: APPROXIMATELY 14 MILES SOUTH OF WINCHESTER, IDAHO

DISTRICT: WALLA WALLA
P.O.C.: KIM CALLAN, CHIEF, COST ENGINEERING

			CURRENT MCACES ESTIMATE PREPARED: 24 FEB 99 EFFECTIVE PRICING LEVEL: 1 OCT 99				AUTHORIZ./BUDGET YEAR: 1999 EFFECT. PRICING LEVEL: 1 OCT 98				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT NUMBER		FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
08.--		ACCESS ROAD	774	155	20%	929	2.6%	795	159	954	1 QTR 01	5.3%	837	167	1,004
		Improve Dirt Access Roads, Approx 14.22 Miles													
		LETTER REPORT dated, May 1999, to ev													
		TOTAL CONSTRUCTION COSTS =====:	774	155	20%	929		795	159	954			837	167	1,004
01---		LANDS AND DAMAGES													
22---		FEASIBILITY STUDIES													
30---		PLANNING, ENGINEERING & DESIGN													
	0.8%	Project Management	7	1	20%	8	2.6%	7	1	8	1 QTR 00	2.6%	7	1	8
	1.0%	Planning & Environmental Compliance	8	2	20%	10	2.6%	8	2	10	1 QTR 00	2.6%	8	2	10
	5.0%	Engineering & Design	40	8	20%	48	2.6%	41	8	49	1 QTR 00	2.6%	42	8	50
	1.0%	Engineering Tech Review & VE	8	2	20%	10	2.6%	8	2	10	1 QTR 00	2.6%	8	2	10
	1.0%	Contracting & Reprographics	8	2	20%	10	2.6%	8	2	10	1 QTR 00	2.6%	8	2	10
	3.0%	Engineering During Construction	23	5	20%	28	2.6%	24	5	29	1 QTR 01	5.3%	25	5	30
31---		CONSTRUCTION MANAGEMENT													
	7.0%	Construction Management	9	2	20%	11	2.6%	9	2	11	1 QTR 01	5.3%	9	2	11
	0.8%	Project Management	1		20%	1	2.6%	1		1	1 QTR 01	5.3%	1		1
			878	177	20%	1,055		901	181	1,082			945	189	1,134
06.2--		GOVERNMENT FURNISH MATERIALS													
30---		PLANNING, ENGINEERING & DESIGN													
	15.0%	Engineering & Design													
	1.0%	Contracting & Reprographics													
		TOTAL GFS COSTS =====>													

DEER CREEK RCC DAM & ROADS
Near Winchester, Nothern Idaho
PRICE LEVEL 1 Oct 1998
SALES TAX RATE 5.0%, TERO 1.5%
--FOR OFFICIAL USE ONLY--

Designed By: Walla Walla Corp's Engineers
Estimated By: Karl Pankaskie

Prepared By: Walla Walla Cost Engineer Branch
Kim Callan, CHIEF, COST ENGR

Preparation Date: 04/16/99
Effective Date of Pricing: 10/01/99
Est Construction Time: 250 Days

Sales Tax: 5.00%

DEER CREEK DAM PROJECT DESCRIPTIONS

Main Dam
This option for Deer Creek Dam will be a straight-axis gravity dam structure approximately 600 feet long at the top of the dam. The dam structure will be 80 feet high measured from the deepest point in the foundation. The hydraulic head will be 70 feet measured from the assumed invert elevation of the streambed.

RCC Dam
This estimate consists of costs to construct a roller compacted concrete (RCC) dam. The RCC structure could incorporate RCC with an upstream precast concrete, vertical face paneling system. Between the dam and vertical face panels will be a waterproof membrane that seals up the upstream face of dam. In addition to the RCC core and vertical face panels, an 80' deep, 5' space, grout curtain will be established beneath the dam to try to reduce leakage beneath the dam. No gallery will be constructed in the RCC dam because of the low volume of RCC required.

Spillway
An overflow emergency spillway with a 150-foot crest length is proposed. The spillway will be constructed on the left abutment where a natural saddle would allow for an overland flow of water away from the embankment and back into the Deer Creek downstream of the dam. The spillway features are the approach channel, the formed concrete ogee (including the spillway crest), and the spillway chute.

Outlet Works and Impact Basin
The outlet works will consist of an intake tower with gates and controls, a 48-inch conduit, and an impact basin energy dissipater.

A low-level intake structure would be constructed upstream next to the dam, connected to the outlet conduit pipe for delivering water downstream through the dam and back into Deer Creek through an outlet structure. This concrete box structure will have two slide gates with operators to control the flow of water through the structure.

The outlet conduit pipe will include a concrete embedded 48-inch steel pipe conduit. This pipe will also be used as part of the dewater works.

The impact basin structure would be constructed downstream of the dam and connected to the outlet conduit pipe for delivering water back into the stream. The concrete box structure will have baffles to dissipate water energy and to allow proper flow back into the stream.

Conventional concrete will be used for construction of the spillway cap, training walls, conduit encasement, intake tower, impact basin structure, lift joint bedding, and foundation bedding.

Reservoir
The Deer Creek reservoir is approximate 1.5 miles in length. The reservoir basin area at the dam site is approximately 111 acres. Some of the reservoir is forested and will need some preparation for the water that will contained

by the dam.

Access Road
Approximately 14.22 miles of access roads will need some improvements. The existing dirt roads shall be leveled, graded, and compacted. Four inches of base material will be placed, graded, and compacted with two inches of gravel top course material placed, graded and compacted on top. This should provide an adequate foundation for the vehicles to access the dam site. A one-lane road with turnouts every 2,000 feet is suggested. Plate - 3 shows the locations of roads needed to be improved and new road sections that will be needed to connect them. New road sections and turnouts should be placed in the field to minimize the amount of environmental damage. As shown on plate 3, some construction roads will need to be 2 lane for construction traffic.

BASIS OF DESIGN
This estimate is for letter report dated May 1999 to evaluate dam alternatives for the Deer Creek Site for the Nez Perce Tribe.

CONSTRUCTION SCHEDULE
The contractor shall commence work under this contract within 10 calendar days of receiving the notice to proceed; prosecute said work diligently; and complete the entire work ready for use, within the time frame below:

Construction period of the road is unknown at this time.
Construction period of the reservoir is unknown at this time.
Construction period of the dam is unknown at this time.

CONSTRUCTION WINDOWS
Construction windows of the all work are unknown at this time.

OVERTIME
This estimate contains overtime to complete the project because of the short construction seasons due to high mountain weather.
Overtime was used in the development for the following item costs:

Quarry, drilling, and blasting work
Drilling, and grouting work
High volume earthmoving work
High volume RCC work

The standard contingency of 20% was used for this project.

ACQUISITION PLAN
The three low bidding contracts are required as follows 1) constructing the main dam, 2) constructing the roadwork, and 3) clearing the reservoir.

SUB-CONTRACTING PLAN
The following are subcontractors on this project:

Crushing and Batching Subcontractor (AH)
Drilling Subcontractor (AG)
Blasting Subcontractor (AI)
Grouting Subcontractor (AK)
Shotcrete Subcontractor (AL)
Fencing Subcontractor (AF)
Guard Rail Subcontractor ()

Sitework Subcontractor ()

It is assumed that the prime contractor will do the rest of the work.

PROJECT CONSTRUCTION

SITE ACCESS

Deer Creek Dam site is located on Deer Creek in Lewis County, Idaho and extends across Sections 18, 20, and 28 in T.32N, R.3 W., Boise Meridian. It is located on lands owned by the Nez Perce Tribe in the heart of Nez Perce National Forest. The site is approximately 14 miles south of Winchester, Idaho.

BORROW AREAS

The borrow sources for Deer Creek RCC dam is as follows:
The random fill material will be obtained from excavating the valley floor.

The sand filter, cobbles or gravel bedding, riprap or cobbles will be available by process crushing (at the same time) materials from the spillway excavation, left abutment quarry or access road quarry. Note: In the quarry site and at a depth of about 15-feet, rocks of 8-to 24-inch size are suitable to be process into riprap or cobbles.

The borrow sources for concrete aggregates will be available by process crushing material from the same sources. Cement can be hauled in and stored on site.

The water source for earth compaction, concrete, and RCC production will be available from surface water. Upstream of the RCC material sources, a small dike with a culvert will be built. The structure will be constructed to store water for earth compaction, RCC and concrete requirements. Groundwater may be a viable option; however, no active wells exist in the vicinity of the construction site. The effects of water on properties of concrete should be investigated during production of mix design trials.

CONSTRUCTION METHODOLOGY

The construction methodology is standard dam construction.

The site needs to be dewatered because Deer Creek runs through the dam location. A small upstream, earth dike will divert water into a pipe, which becomes a part of the outlet works.

UNUSUAL CONDITIONS (Soil, Water, Weather)

No unusual conditions occur at the site.

UNIQUE TECHNIQUES OF CONSTRUCTION

RCC will be batched at a site plant, a conveyer will transport it to a hopper at the dam, and then a loader will transport it to placement location. The RCC mix will be spread with a small dozer and compacted with a ten ton vibrating roller. This is a time / temperature operation.

EQUIPMENT AND LABOR AVAILABILITY & DISTANCE TRAVELED

This estimate uses Davis Bacon labor rates for Lewis County, revision number

11, dated 2/32/99. See the labor spread sheet for development of labor costs used in the estimate.
Equipment rates used are from EP 1110-1-8, Volume 3, September 1997.

ENVIRONMENTAL CONCERNS
This estimate has provisions for Monthly Anticipated Adverse Weather Delays as specified in the contract clauses.

This estimate acknowledges no amendments at this time.

This work will not be performed by a contractor under the Small Business Administration 8a program.

Prices are good for the period May 1999 through October 1999. Total project costs summary spreadsheet will take care of inflation after that.
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No Detailed Estimate...

No Backup Reports...

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U.S. Army Corps of Engineers
PROJECT DEERC2: DEER CREEK RCC DAM & ROADS - Near Winchester, Northern Idaho
RCC DAM FOR DEER CREEK, BUDGET ESTIMATE
** PROJECT INDIRECT SUMMARY - Element **

	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC DEER CREEK RCC DAM & ROADS										
AC-03 RESERVOIRS										
AC-03.1 RESERVOIRS										
AC-03.1.3 CLEARING AND DEBRIS REMOVAL	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
AC-04 DAMS (ROLLER COMPACTED CONCRETE)										
AC-04.1 MAIN DAM										
AC-04.1.A MOB., DEMOB., AND PREWORK			148,711	22,307	6,841	12,450	2,855	3,863	197,026	
AC-04.1.C SITE ACCESS ROADS & PARKING			88,568	13,285	4,074	7,415	1,700	2,301	117,343	
AC-04.1.D EARTHWORK FOR STRUCTURES	6400.00	CY	52,217	7,833	2,402	4,372	1,002	1,357	69,183	10.81
AC-04.1.E FOUNDATION WORK	20000	SF	265,564	39,835	12,216	22,233	5,098	6,899	351,845	17.59
AC-04.1.S ROLLER COMPACTED CONCRETE DAM	44000	CY	1813390	272,008	83,416	151,817	34,809	47,109	2402550	54.60
TOTAL MAIN DAM	44000	CY	2368451	355,268	108,949	198,287	45,464	61,528	3137946	71.32
AC-04.2 SPILLWAY										
AC-04.2.9 EARTHWORK FOR STRUCTURES			78,647	11,797	3,618	6,584	1,510	2,043	104,199	
AC-04.2.A FOUNDATION WORK			1,948	292	90	163	37	51	2,580	
AC-04.2.F CONCRETE OVERFLOW SECTION			68,330	10,249	3,143	5,721	1,312	1,775	90,530	
TOTAL SPILLWAY	1.00	EA	148,924	22,339	6,851	12,468	2,859	3,869	197,309	197309
AC-04.3 OUTLET WORKS										
AC-04.3.1 APPROACH AND OUTLET CHANNELS	1.00	EA	20,564	3,085	946	1,722	395	534	27,246	27246
AC-04.3.3 CONDUIT OR TUNNEL	92.00	LF	30,978	4,647	1,425	2,593	595	805	41,042	446.11
AC-04.3.4 INTAKE STRUCTURE	45.00	VLF	85,965	12,895	3,954	7,197	1,650	2,233	113,894	2530.99
TOTAL OUTLET WORKS	92.00	LF	137,507	20,626	6,325	11,512	2,640	3,572	182,182	1980.24
TOTAL DAMS (ROLLER COMPACTED CONCRETE)	44000	CY	2654882	398,232	122,125	222,267	50,963	68,969	3517437	79.94
AC-08 ROADS, RAILROADS, AND BRIDGES										
AC-08.1 ROADS										

U.S. Army Corps of Engineers

PROJECT DEERC2: DEER CREEK RCC DAM & ROADS - Near Winchester, Nothern Idaho
RCC DAM FOR DEER CREEK, BUDGET ESTIMATE
** PROJECT INDIRECT SUMMARY - Element **

		QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-08.1.B	FOREST ROAD, IMPROVE EXISTING(A)	36600 LF	457,831	68,675	33,327	39,188	8,985	12,160	620,166	16.94
AC-08.1.C	NEW PERM SITE ACCESS ROADS (B)	1050.00 LF	55,935	8,390	4,401	4,811	1,103	1,493	76,133	72.51
AC-08.1.D	NEW PERM-TO-TOP OF DAM A-ROAD(C)	1735.00 LF	57,443	8,617	4,462	4,937	1,132	1,532	78,122	45.03
	TOTAL ROADS	45301 LF	571,210	85,681	42,190	48,936	11,220	15,185	774,421	17.10
	TOTAL ROADS, RAILROADS, AND BRIDGES	14.23 MI	571,210	85,681	42,190	48,936	11,220	15,185	774,421	54436
	TOTAL DEER CREEK RCC DAM & ROADS		3313640	492,669	171,056	278,416	63,837	86,392	4406009	

		QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC	DEER CREEK RCC DAM & ROADS										
AC-03	RESERVOIRS										
AC-03.1	RESERVOIRS										
AC-03.1.3	CLEARING AND DEBRIS REMOVAL										
AC-03.1.3-01-	CLEARING AND DEBRIS REMOVAL										
AC-03.1.3-01--02AB	Clear, Grubb,Hvy Brush&Lgh Trees	11.00	ACR	44,830	4,483	3,452	3,694	847	1,146	58,451	5313.76
AC-03.1.3-01--02AD	Clr,H-Brush W/Avg Grub,M/H-Trees	100.00	ACR	42,719	4,272	3,289	3,520	807	1,092	55,699	556.99
	TOTAL CLEARING AND DEBRIS REMOVAL	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
	TOTAL CLEARING AND DEBRIS REMOVAL	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
	TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
	TOTAL RESERVOIRS	111.00	ACR	87,549	8,755	6,741	7,213	1,654	2,238	114,151	1028.39
AC-04	DAMS (ROLLER COMPACTED CONCRETE)										
AC-04.1	MAIN DAM										
AC-04.1.A	MOB., DEMOB., AND PREWORK										
AC-04.1.A-01-	MOB., DEMOB., AND PREWORK										
AC-04.1.A-01--AA	Prime Contractor Mob.			48,192	7,229	2,217	4,035	925	1,252	63,850	
AC-04.1.A-01--AB	Prime Contractor Demob			17,518	2,628	806	1,467	336	455	23,209	
AC-04.1.A-01--BA	Nx-Exploratory Mob & Demob			1,970	295	91	165	38	51	2,609	
AC-04.1.A-01--BD	Blasting Subcontractor			3,165	475	146	265	61	82	4,194	
AC-04.1.A-01--BE	Fencing Subcontractor			1,846	277	85	155	35	48	2,446	
AC-04.1.A-01--CA	Shotcrete Mob & Demob	2.00	TRP	1,906	286	88	160	37	50	2,525	1262.46
AC-04.1.A-01--CB	RCC Batch Plant			22,157	3,324	1,019	1,855	425	576	29,356	
AC-04.1.A-01--CC	RCC Convayor System			2,185	328	101	183	42	57	2,895	
AC-04.1.A-01--CD	Crushing Plant			12,513	1,877	576	1,048	240	325	16,579	
	TOTAL MOB., DEMOB., AND PREWORK			111,452	16,718	5,127	9,331	2,139	2,895	147,662	
AC-04.1.A-02-	DIVERSION AND CARE OF WATER										
AC-04.1.A-02--02AA	Diversion Conduit 48" Dia CMP	240.00	LF	21,589	3,238	993	1,807	414	561	28,603	119.18
AC-04.1.A-02--02BA	Diversion Conduit Upper Dike	1800.00	CY	1,601	240	74	134	31	42	2,122	1.18
AC-04.1.A-02--02JA	Dr Conduit Connect to Inlet Str	1.00	EA	0	0	0	0	0	0	0	0.01
AC-04.1.A-02--02KA	Remove D Conduit 48" Dia CMP	240.00	LF	3,638	546	167	305	70	94	4,819	20.08

** PROJECT INDIRECT SUMMARY - IND CODE **

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.A-02--02LA Remove Diversion Upper Dike	1800.00 CY	2,445	367	112	205	47	64	3,239	1.80
TOTAL DIVERSION AND CARE OF WATER	240.00 LF	29,272	4,391	1,347	2,451	562	760	38,783	161.59
AC-04.1.A-03- STORAGE &PONDING OF CONSTR WATER									
AC-04.1.A-03--02AA Diversion Conduit 48" Dia CMP	40.00 LF	3,464	520	159	290	66	90	4,589	114.72
AC-04.1.A-03--02BA Diversion Conduit Upper Dike	1800.00 CY	1,601	240	74	134	31	42	2,122	1.18
AC-04.1.A-03--02KA Remove D Conduit 48" Dia CMP	40.00 LF	606	91	28	51	12	16	803	20.08
AC-04.1.A-03--02LA Remove Diversion Upper Dike	1800.00 CY	2,315	347	106	194	44	60	3,067	1.70
TOTAL STORAGE &PONDING OF CONSTR WATER	1.00 EA	7,986	1,198	367	669	153	207	10,581	10581
TOTAL MOB., DEMOB., AND PREWORK		148,711	22,307	6,841	12,450	2,855	3,863	197,026	
AC-04.1.C SITE ACCESS ROADS & PARKING									
AC-04.1.C-03- SITE FENCING									
AC-04.1.C-03--02BA 6' Site Fencing	630.00 LF	13,396	2,009	616	1,122	257	348	17,749	28.17
AC-04.1.C-03--02BC 6' Site Fencing Gates	3.00 EA	3,123	468	144	261	60	81	4,137	1379.13
TOTAL SITE FENCING	630.00 LF	16,519	2,478	760	1,383	317	429	21,886	34.74
AC-04.1.C-04- DECK FENCING									
AC-04.1.C-04--02BA Deck Fencing Right Side	610.00 LF	25,705	3,856	1,182	2,152	493	668	34,056	55.83
AC-04.1.C-04--02BB Deck Fencing Left Side	610.00 LF	24,826	3,724	1,142	2,078	477	645	32,892	53.92
TOTAL DECK FENCING	1220.00 LF	50,531	7,580	2,324	4,230	970	1,313	66,948	54.88
AC-04.1.C-05- DRYLAND GRASS ESTABLISHMENT									
AC-04.1.C-05--02BA Dryland Grass Establishment	3.00 ACR	6,300	945	290	527	121	164	8,347	2782.28
TOTAL DRYLAND GRASS ESTABLISHMENT	3.00 ACR	6,300	945	290	527	121	164	8,347	2782.28
AC-04.1.C-06- CULVERTS - 18 INCH (1 EACH)									
AC-04.1.C-06--02AA Culverts - Excavation	7.00 CY	192	29	9	16	4	5	255	36.42
AC-04.1.C-06--02BA Culverts - 18 Inch CMP	20.00 LF	400	60	18	33	8	10	530	26.49
AC-04.1.C-06--02CA Culverts - Backfill Bedding	5.00 CY	508	76	23	43	10	13	673	134.61
TOTAL CULVERTS - 18 INCH (1 EACH)	20.00 LF	1,100	165	51	92	21	29	1,458	72.88

		QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.C-11-	TRILATERATION SURVEY									
AC-04.1.C-11--02BA	Trilateration Caps on Rock	2.00 EA	447	67	21	37	9	12	592	296.24
AC-04.1.C-11--02BB	Trilateration Caps in Soil	1.00 EA	505	76	23	42	10	13	670	669.50
AC-04.1.C-11--02BC	Survey Markers on RCC Dam	7.00 EA	1,503	225	69	126	29	39	1,991	284.50
AC-04.1.C-11--02BD	Survey (Trilateration Survey)	4.00 DAY	1,963	294	90	164	38	51	2,601	650.26
	TOTAL TRILATERATION SURVEY	3.00 EA	4,419	663	203	370	85	115	5,855	1951.50
AC-04.1.C-12-	SITE ACCESS & HAUL ROADS									
AC-04.1.C-12--02DA	Constr Road D1,Grade Road Bed12w	1751.00 SY	1,729	259	80	145	33	45	2,290	1.31
AC-04.1.C-12--02DC	Constr Road D2,Grade Road Bed20w	2920.00 SY	2,883	432	133	241	55	75	3,819	1.31
AC-04.1.C-12--02EA	Constr Road E,Grade Road Bed 12w	1390.00 SY	1,372	206	63	115	26	36	1,818	1.31
AC-04.1.C-12--02FA	Constr Road F,Grade Road Bed 12w	800.00 SY	790	118	36	66	15	21	1,046	1.31
AC-04.1.C-12--02GA	Constr Road G,Grade Road Bed 12w	630.00 SY	622	93	29	52	12	16	824	1.31
AC-04.1.C-12--02HA	Constr Road H,Grade Road Bed 20w	2333.00 SY	2,303	345	106	193	44	60	3,051	1.31
	TOTAL SITE ACCESS & HAUL ROADS	45250 LF	9,698	1,455	446	812	186	252	12,849	0.28
	TOTAL SITE ACCESS ROADS & PARKING		88,568	13,285	4,074	7,415	1,700	2,301	117,343	
AC-04.1.D	EARTHWORK FOR STRUCTURES									
AC-04.1.D-12A	EXCAVATION,UNCLASF									
AC-04.1.D-12A-02AA	Excavation and Strip Foundation	5220.00 SY	27,477	4,122	1,264	2,300	527	714	36,404	6.97
AC-04.1.D-12A-02BA	Excavation and Haul Common	5200.00 BCY	13,297	1,995	612	1,113	255	345	17,617	3.39
AC-04.1.D-12A-02BB	Excavation and Trim Common	1000.00 BCY	1,540	231	71	129	30	40	2,040	2.04
AC-04.1.D-12A-02BC	Rip Rock	300.00 BCY	1,360	204	63	114	26	35	1,802	6.01
AC-04.1.D-12A-02BD	Blast Boulders	18.00 BCY	1,018	153	47	85	20	26	1,349	74.92
AC-04.1.D-12A-02BE	Load & Haul Ripped &Blasted Rock	300.00 BCY	819	123	38	69	16	21	1,084	3.61
AC-04.1.D-12A-02BF	Maintain Haul Roads	5500.00 BCY	6,707	1,006	309	562	129	174	8,886	1.62
	TOTAL EXCAVATION,UNCLASF	5500.00 CY	52,217	7,833	2,402	4,372	1,002	1,357	69,183	12.58
	TOTAL EARTHWORK FOR STRUCTURES	6400.00 CY	52,217	7,833	2,402	4,372	1,002	1,357	69,183	10.81
AC-04.1.E	FOUNDATION WORK									
AC-04.1.E-16A	EXPLORATORY DRILLING									
AC-04.1.E-16A-02BA	Nx Exploratory Drilling	200.00 LF	17,817	2,673	820	1,492	342	463	23,606	118.03
	TOTAL EXPLORATORY DRILLING	200.00 LF	17,817	2,673	820	1,492	342	463	23,606	118.03
AC-04.1.E-17A	PRESURE TESTING NX HOLE									

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.E-17A-02BA Presure Testing NX Hole	200.00 MIN	1,600	240	74	134	31	42	2,120	10.60
TOTAL PRESURE TESTING NX HOLE	200.00 MIN	1,600	240	74	134	31	42	2,120	10.60
AC-04.1.E-19A FOUNDATION CLEANUP									
AC-04.1.E-19A-02BA Foundation Cleanup	4240.00 SY	61,101	9,165	2,811	5,115	1,173	1,587	80,953	19.09
TOTAL FOUNDATION CLEANUP	4240.00 SY	61,101	9,165	2,811	5,115	1,173	1,587	80,953	19.09
AC-04.1.E-22A FOUND.TREAT.DRILL GROUT CURTAIN									
AC-04.1.E-22A-02BA Drill Foundation Grout Curtain	6400.00 LF	73,035	10,955	3,360	6,114	1,402	1,897	96,763	15.12
TOTAL FOUND.TREAT.DRILL GROUT CURTAIN	6400.00 LF	73,035	10,955	3,360	6,114	1,402	1,897	96,763	15.12
AC-04.1.E-23A FOUND.TREAT.DRILL HOLE SETUPS									
AC-04.1.E-23A-03AA Grout Holes Setups	240.00 EA	23,810	3,571	1,095	1,993	457	619	31,546	131.44
TOTAL FOUND.TREAT.DRILL HOLE SETUPS	240.00 EA	23,810	3,571	1,095	1,993	457	619	31,546	131.44
AC-04.1.E-24A FOUND.TREAT.WATER PRESSURE TESTG									
AC-04.1.E-24A-03BA Water Pressure Testing	240.00 EA	18,726	2,809	861	1,568	359	486	24,809	103.37
TOTAL FOUND.TREAT.WATER PRESSURE TESTG	240.00 EA	18,726	2,809	861	1,568	359	486	24,809	103.37
AC-04.1.E-25A FOUND.TREAT.GROUT QUANTITIES									
AC-04.1.E-25A-03AA Cement Grout HRWRA Admixture	720.00 GAL	13,305	1,996	612	1,114	255	346	17,627	24.48
AC-04.1.E-25A-03CA Cement Bulk Grout	4515.00 CWT	25,668	3,850	1,181	2,149	493	667	34,007	7.53
TOTAL FOUND.TREAT.GROUT QUANTITIES	4515.00 CWT	38,972	5,846	1,793	3,263	748	1,012	51,634	11.44
AC-04.1.E-26- DENTAL CONCRETE									
AC-04.1.E-26--03CA Dental Concrete	200.00 CY	30,503	4,576	1,403	2,554	586	792	40,414	202.07
TOTAL DENTAL CONCRETE	200.00 CY	30,503	4,576	1,403	2,554	586	792	40,414	202.07
TOTAL FOUNDATION WORK	20000 SF	265,564	39,835	12,216	22,233	5,098	6,899	351,845	17.59

AC-04.1.S ROLLER COMPACTED CONCRETE DAM

** PROJECT INDIRECT SUMMARY - IND CODE **

		QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-04.1.S-23-	RCC TEST PLACEMENT										
AC-04.1.S-23--02AZ	Rcc, Drill, Shot & Producing	239.00	CY	2,642	396	122	221	51	69	3,500	14.64
AC-04.1.S-23--02BB	Crushing & Stockpile Materials	440.01	CY	2,194	329	101	184	42	57	2,907	6.61
AC-04.1.S-23--03BC	Water for RCC	7.27	MGL	290	44	13	24	6	8	385	52.88
AC-04.1.S-23--03CA	RCC Concrete,1 Test Slab,5 Strip	300.00	CY	19,892	2,984	915	1,665	382	517	26,355	87.85
AC-04.1.S-23--03CB	Remove RCC Conc.,1 Slab,5 Strip	300.00	CY	1,197	179	55	100	23	31	1,585	5.28
	TOTAL RCC TEST PLACEMENT	300.00	CY	26,215	3,932	1,206	2,195	503	681	34,732	115.77
AC-04.1.S-24A	RCC CONCRETE										
AC-04.1.S-24A-01AA	RCC Conc, Downstream Safety Rail	150.00	LF	3,625	544	167	304	70	94	4,803	32.02
AC-04.1.S-24A-02AZ	Rcc Conc, Drill Shot & Prod Mat	35021	CY	198,616	29,792	9,136	16,628	3,813	5,160	263,145	7.51
AC-04.1.S-24A-02BB	RCC Conc,Crushing &Stockpile Mat	59308	LCY	292,851	43,928	13,471	24,517	5,622	7,608	387,996	6.54
AC-04.1.S-24A-03BC	RCC Conc, Water for RCC	1024.00	MGL	28,974	4,346	1,333	2,426	556	753	38,387	37.49
AC-04.1.S-24A-03BD	RCC Conc, Blend Sand for RCC	4590.00	CY	10,881	1,632	501	911	209	283	14,417	3.14
AC-04.1.S-24A-03CF	RCC Conc, Placing RCC Mix	44000	CY	724,078	108,612	33,308	60,620	13,899	18,810	959,326	21.80
	TOTAL RCC CONCRETE	44000	CY	1259025	188,854	57,915	105,406	24,168	32,707	1668075	37.91
AC-04.1.S-25A	CEMENT FOR RCC CONCRETE										
AC-04.1.S-25A-03CA	Cement for RCC	56166	CWT	206,410	30,962	9,495	17,281	3,962	5,362	273,471	4.87
	TOTAL CEMENT FOR RCC CONCRETE	56166	CWT	206,410	30,962	9,495	17,281	3,962	5,362	273,471	4.87
AC-04.1.S-26A	AIR ENTRAIN ADM. RCC										
AC-04.1.S-26A-03CA	Air Entrain Adm.RCC	236.00	GAL	1,016	152	47	85	20	26	1,346	5.70
	TOTAL AIR ENTRAIN ADM. RCC	236.00	GAL	1,016	152	47	85	20	26	1,346	5.70
AC-04.1.S-27A	WATER REDUC ADM.RCC										
AC-04.1.S-27A-03CA	Water Reduc Adm.RCC	6144.00	GAL	48,384	7,258	2,226	4,051	929	1,257	64,104	10.43
	TOTAL WATER REDUC ADM.RCC	6144.00	GAL	48,384	7,258	2,226	4,051	929	1,257	64,104	10.43
AC-04.1.S-29A	VERT.FACING SYSTEM DAM										
AC-04.1.S-29A-03CA	Vert.Facing System	2871.00	SY	248,456	37,268	11,429	20,801	4,769	6,454	329,178	114.66
AC-04.1.S-29A-03CC	Vert.Facing System, Starter Slab	100.00	CY	23,884	3,583	1,099	2,000	458	620	31,644	316.44
	TOTAL VERT.FACING SYSTEM DAM	2871.00	SY	272,340	40,851	12,528	22,800	5,228	7,075	360,822	125.68

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
TOTAL ROLLER COMPACTED CONCRETE DAM	44000 CY	1813390	272,008	83,416	151,817	34,809	47,109	2402550	54.60
TOTAL MAIN DAM	44000 CY	2368451	355,268	108,949	198,287	45,464	61,528	3137946	71.32
AC-04.2 SPILLWAY									
AC-04.2.9 EARTHWORK FOR STRUCTURES									
AC-04.2.9-11A EXCAVATION,UNCLASF									
AC-04.2.9-11A-02AA Excavation and Strip Foundation	5220.00 SY	27,477	4,122	1,264	2,300	527	714	36,404	6.97
AC-04.2.9-11A-02BA Excavation and Haul Common	5080.00 BCY	15,588	2,338	717	1,305	299	405	20,653	4.07
AC-04.2.9-11A-02BB Excavation and Trim Common	1000.00 BCY	1,540	231	71	129	30	40	2,040	2.04
AC-04.2.9-11A-02BC Rip Rock	300.00 BCY	1,360	204	63	114	26	35	1,802	6.01
AC-04.2.9-11A-02BD Blast Boulders	12.00 BCY	679	102	31	57	13	18	899	74.92
AC-04.2.9-11A-02BE Load & Haul Ripped &Blasted Rock	300.00 BCY	819	123	38	69	16	21	1,084	3.61
TOTAL EXCAVATION,UNCLASF	3700.00 CY	47,462	7,119	2,183	3,974	911	1,233	62,882	17.00
AC-04.2.9-12A EXCAVATION,ROCK EXCAVATION									
AC-04.2.9-12A-02BC Presplit Rock, Drill, & Shot	1400.00 LF	31,185	4,678	1,434	2,611	599	810	41,316	29.51
TOTAL EXCAVATION,ROCK EXCAVATION	9120:00 CY	31,185	4,678	1,434	2,611	599	810	41,316	4.53
TOTAL EARTHWORK FOR STRUCTURES		78,647	11,797	3,618	6,584	1,510	2,043	104,199	
AC-04.2.A FOUNDATION WORK									
AC-04.2.A-19A FOUNDATION CLEANUP									
AC-04.2.A-19A-02BA Foundation Cleanup	150.00 SY	1,948	292	90	163	37	51	2,580	17.20
TOTAL FOUNDATION CLEANUP	150.00 SY	1,948	292	90	163	37	51	2,580	17.20
TOTAL FOUNDATION WORK		1,948	292	90	163	37	51	2,580	
AC-04.2.F CONCRETE OVERFLOW SECTION									
AC-04.2.F-20- CONCRETE OVERFLOW SECTION									
AC-04.2.F-20--03CA Concrete Overflow Section	245.00 CY	45,711	6,857	2,103	3,827	877	1,187	60,562	247.19
AC-04.2.F-20--03DA Concrete Retaining Walls' Slabs	15.00 CY	3,863	579	178	323	74	100	5,118	341.20
AC-04.2.F-20--03DD Concrete Retaining Walls	50.00 CY	18,756	2,813	863	1,570	360	487	24,850	497.00
TOTAL CONCRETE OVERFLOW SECTION	355.00 CY	68,330	10,249	3,143	5,721	1,312	1,775	90,530	255.01

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
TOTAL CONCRETE OVERFLOW SECTION		68,330	10,249	3,143	5,721	1,312	1,775	90,530	
TOTAL SPILLWAY	1.00 EA	148,924	22,339	6,851	12,468	2,859	3,869	197,309	197309
AC-04.3 OUTLET WORKS									
AC-04.3.1 APPROACH AND OUTLET CHANNELS									
AC-04.3.1-35- CONCRETE OUTLET & IMPACT BASIN									
AC-04.3.1-35--02BG Outlet Channel Rip Rap,20" Thick	100.00 ECY	9,155	1,373	421	766	176	238	12,130	121.30
AC-04.3.1-35--03CC Concr.Impact Basin Slab	5.00 CY	1,591	239	73	133	31	41	2,108	421.56
AC-04.3.1-35--03CD Concr.Impact Basin Wall & Baffle	15.00 CY	8,876	1,331	408	743	170	231	11,759	783.94
AC-04.3.1-35--03CE Concr.Impact Basin Precast Slab	2.00 CY	942	141	43	79	18	24	1,249	624.29
TOTAL CONCRETE OUTLET & IMPACT BASIN	1.00 EA	20,564	3,085	946	1,722	395	534	27,246	27246
TOTAL APPROACH AND OUTLET CHANNELS	1.00 EA	20,564	3,085	946	1,722	395	534	27,246	27246
AC-04.3.3 CONDUIT OR TUNNEL									
AC-04.3.3-33- OUTLET CONDUIT (48" DIA. PIPE)									
AC-04.3.3-33--02QA Outlet Conduit (48" Dia. Pipe)	92.00 LF	16,941	2,541	779	1,418	325	440	22,445	243.97
TOTAL OUTLET CONDUIT (48" DIA. PIPE)	92.00 LF	16,941	2,541	779	1,418	325	440	22,445	243.97
AC-04.3.3-34A OUTLET CONDUIT CONCRETE									
AC-04.3.3-34A-03CA Outlet Conduit Concrete	83.00 CY	14,037	2,105	646	1,175	269	365	18,597	224.06
TOTAL OUTLET CONDUIT CONCRETE	83.00 CY	14,037	2,105	646	1,175	269	365	18,597	224.06
TOTAL CONDUIT OR TUNNEL	92.00 LF	30,978	4,647	1,425	2,593	595	805	41,042	446.11
AC-04.3.4 INTAKE STRUCTURE									
AC-04.3.4-32- INTAKE STRUCTURE									
AC-04.3.4-32--02CA Intake Tower Foundation Slab	16.00 CY	3,357	504	154	281	64	87	4,447	277.96
AC-04.3.4-32--03CB Intake Tower Walls	36.00 CY	23,491	3,524	1,081	1,967	451	610	31,123	864.52
AC-04.3.4-32--03CC Intake Tower Elevated Slab	2.00 CY	1,801	270	83	151	35	47	2,386	1193.04
AC-04.3.4-32--03CD Slide Gate Controller Slab	4.00 CY	2,649	397	122	222	51	69	3,509	877.26
AC-04.3.4-32--05EB Intake Tower Trashracks	1770.00 LB	6,698	1,005	308	561	129	174	8,875	5.01
AC-04.3.4-32--15QA 24"x 24" Slide Gate & Controller	2.00 EA	47,097	7,064	2,166	3,943	904	1,223	62,398	31199
AC-04.3.4-32--15QB 12" Dia. Vent Pipe	75.00 LF	873	131	40	73	17	23	1,157	15.42

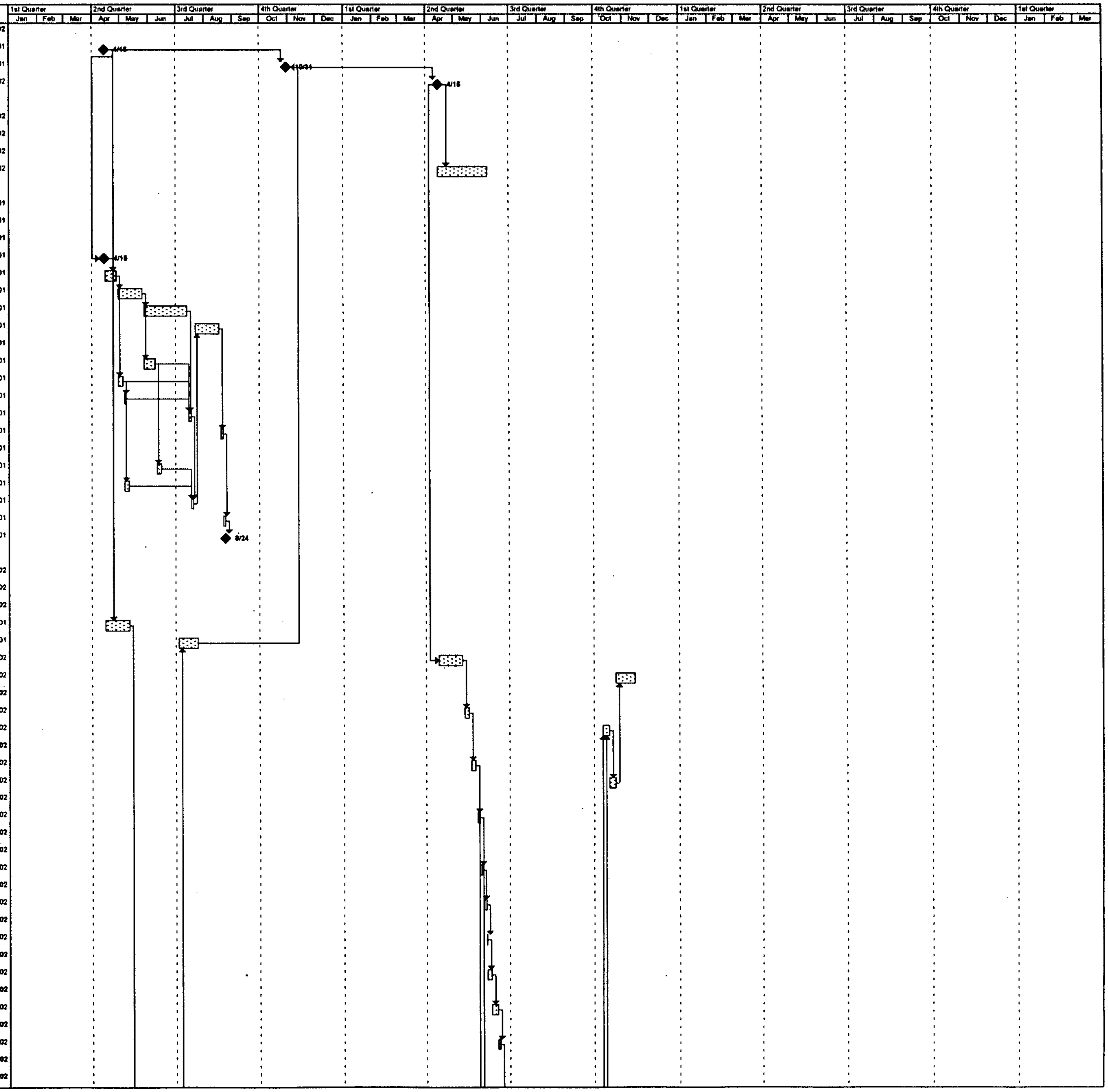
	QUANTY	UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
TOTAL INTAKE STRUCTURE	45.00	VLF	85,965	12,895	3,954	7,197	1,650	2,233	113,894	2530.99
TOTAL INTAKE STRUCTURE	45.00	VLF	85,965	12,895	3,954	7,197	1,650	2,233	113,894	2530.99
TOTAL OUTLET WORKS	92.00	LF	137,507	20,626	6,325	11,512	2,640	3,572	182,182	1980.24
TOTAL DAMS (ROLLER COMPACTED CONCRETE)	44000	CY	2654882	398,232	122,125	222,267	50,963	68,969	3517437	79.94
AC-08 ROADS, RAILROADS, AND BRIDGES										
AC-08.1 ROADS										
AC-08.1.B FOREST ROAD, IMPROVE EXISTING(A)										
AC-08.1.B-02- FOREST ROAD,CRUSHD SURFACING MAT										
AC-08.1.B-02--02BA Produce Surface Materials Dr&Bl	12750	BCY	46,799	7,020	2,153	3,918	898	1,216	62,003	4.86
AC-08.1.B-02--02BB Crushing & Stockpile Materials	11475	LCY	55,486	8,323	2,552	4,645	1,065	1,441	73,513	6.41
TOTAL FOREST ROAD,CRUSHD SURFACING MAT	8500.00	CY	102,285	15,343	4,705	8,563	1,963	2,657	135,517	15.94
AC-08.1.B-03- FOREST ROAD, PREP FOR SURFACING										
AC-08.1.B-03--02AA Forest Roads, Grade Road Bed	48850	SY	38,437	5,765	3,094	3,311	759	1,027	52,393	1.07
TOTAL FOREST ROAD, PREP FOR SURFACING	36600	LF	38,437	5,765	3,094	3,311	759	1,027	52,393	1.43
AC-08.1.B-04- FOREST ROAD, 4" BASE COURSE										
AC-08.1.B-04--02BC Load, Haul & Place Base Course	49050	BCY	211,657	31,749	17,038	18,231	4,180	5,657	288,513	5.88
TOTAL FOREST ROAD, 4" BASE COURSE	49050	SY	211,657	31,749	17,038	18,231	4,180	5,657	288,513	5.88
AC-08.1.B-05- FOREST ROAD, 2" TOP COURSE										
AC-08.1.B-05--02BC Load, Haul & Place Top Course	24525	BCY	105,452	15,818	8,489	9,083	2,083	2,818	143,743	5.86
TOTAL FOREST ROAD, 2" TOP COURSE	49050	SY	105,452	15,818	8,489	9,083	2,083	2,818	143,743	2.93
TOTAL FOREST ROAD, IMPROVE EXISTING(A)	36600	LF	457,831	68,675	33,327	39,188	8,985	12,160	620,166	16.94
AC-08.1.C NEW PERM SITE ACCESS ROADS (B)										
AC-08.1.C-06- ACCESS ROAD,CRUSHD SURFACING MAT										
AC-08.1.C-06--02BA Produce Surface Materials Dr&Bl	368.00	BCY	1,351	203	62	113	26	35	1,790	4.86

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
AC-08.1.C-06--02BB Crushing & Stockpile Materials	331.00 LCY	1,601	240	74	134	31	42	2,121	6.41
TOTAL ACCESS ROAD,CRUSHD SURFACING MAT	245.00 CY	2,951	443	136	247	57	77	3,910	15.96
AC-08.1.C-07- ACCESS ROAD, PREP FOR SURFACING									
AC-08.1.C-07--02AA Forest Roads, Grade Road Bed	48850 SY	38,437	5,765	3,094	3,311	759	1,027	52,393	1.07
TOTAL ACCESS ROAD, PREP FOR SURFACING	1050.00 LF	38,437	5,765	3,094	3,311	759	1,027	52,393	49.90
AC-08.1.C-08- ACCESS ROAD, 4" BASE COURSE									
AC-08.1.C-08--02BC Load, Haul & Place Base Course	1400.00 BCY	6,026	904	485	519	119	161	8,214	5.87
TOTAL ACCESS ROAD, 4" BASE COURSE	1400.00 SY	6,026	904	485	519	119	161	8,214	5.87
AC-08.1.C-09- ACCESS ROAD, 2" TOP COURSE									
AC-08.1.C-09--02BC Load, Haul & Place Top Course	700.00 BCY	3,013	452	243	260	60	81	4,107	5.87
TOTAL ACCESS ROAD, 2" TOP COURSE	1400.00 SY	3,013	452	243	260	60	81	4,107	2.93
AC-08.1.C-10- ACCESS ROAD,CULVERTS-18"(5 EACH)									
AC-08.1.C-10--02AA Culverts - Excavation	34.00 CY	750	113	60	65	15	20	1,023	30.08
AC-08.1.C-10--02BA Culverts - 18 Inch CMP	100.00 LF	1,999	300	161	172	39	53	2,725	27.25
AC-08.1.C-10--02CA Culverts - Backfill Bedding	27.00 CY	2,759	414	222	238	54	74	3,761	139.29
TOTAL ACCESS ROAD,CULVERTS-18"(5 EACH)	100.00 LF	5,509	826	443	474	109	147	7,509	75.09
TOTAL NEW PERM SITE ACCESS ROADS (B)	1050.00 LF	55,935	8,390	4,401	4,811	1,103	1,493	76,133	72.51
AC-08.1.D NEW PERM-TO-TOP OF DAM A-ROAD(C)									
AC-08.1.D-06- ACCESS ROAD,CRUSHD SURFACING MAT									
AC-08.1.D-06--02BA Produce Surface Materials Dr&Bl	585.00 BCY	2,147	322	99	180	41	56	2,845	4.86
AC-08.1.D-06--02BB Crushing & Stockpile Materials	527.00 LCY	2,548	382	117	213	49	66	3,376	6.41
TOTAL ACCESS ROAD,CRUSHD SURFACING MAT	390.00 CY	4,695	704	216	393	90	122	6,221	15.95
AC-08.1.D-07- ACCESS ROAD, PREP FOR SURFACING									
AC-08.1.D-07--02AA Forest Roads, Grade Road Bed	48850 SY	38,437	5,765	3,094	3,311	759	1,027	52,393	1.07

	QUANTY UOM	DIRECT	F-O.Head	Home OFC	Profit	TERO TAX	BOND	TOTAL	UNIT
TOTAL ACCESS ROAD, PREP FOR SURFACING	1735.00 LF	38,437	5,765	3,094	3,311	759	1,027	52,393	30.20
AC-08.1.D-08- ACCESS ROAD, 4" BASE COURSE									
AC-08.1.D-08--02BC Load, Haul & Place Base Course	2320.00 BCY	9,792	1,469	788	843	193	262	13,348	5.75
TOTAL ACCESS ROAD, 4" BASE COURSE	2320.00 SY	9,792	1,469	788	843	193	262	13,348	5.75
AC-08.1.D-09- ACCESS ROAD, 2" TOP COURSE									
AC-08.1.D-09--02BC Load, Haul & Place Top Course	1160.00 BCY	4,519	678	364	389	89	121	6,160	5.31
TOTAL ACCESS ROAD, 2" TOP COURSE	2320.00 SY	4,519	678	364	389	89	121	6,160	2.66
TOTAL NEW PERM-TO-TOP OF DAM A-ROAD(C)	1735.00 LF	57,443	8,617	4,462	4,937	1,132	1,532	78,122	45.03
TOTAL ROADS	45301 LF	571,210	85,681	42,190	48,936	11,220	15,185	774,421	17.10
TOTAL ROADS, RAILROADS, AND BRIDGES	14.23 MI	571,210	85,681	42,190	48,936	11,220	15,185	774,421	54436
TOTAL DEER CREEK RCC DAM & ROADS		3313640	492,669	171,056	278,416	63,837	86,392	4406009	

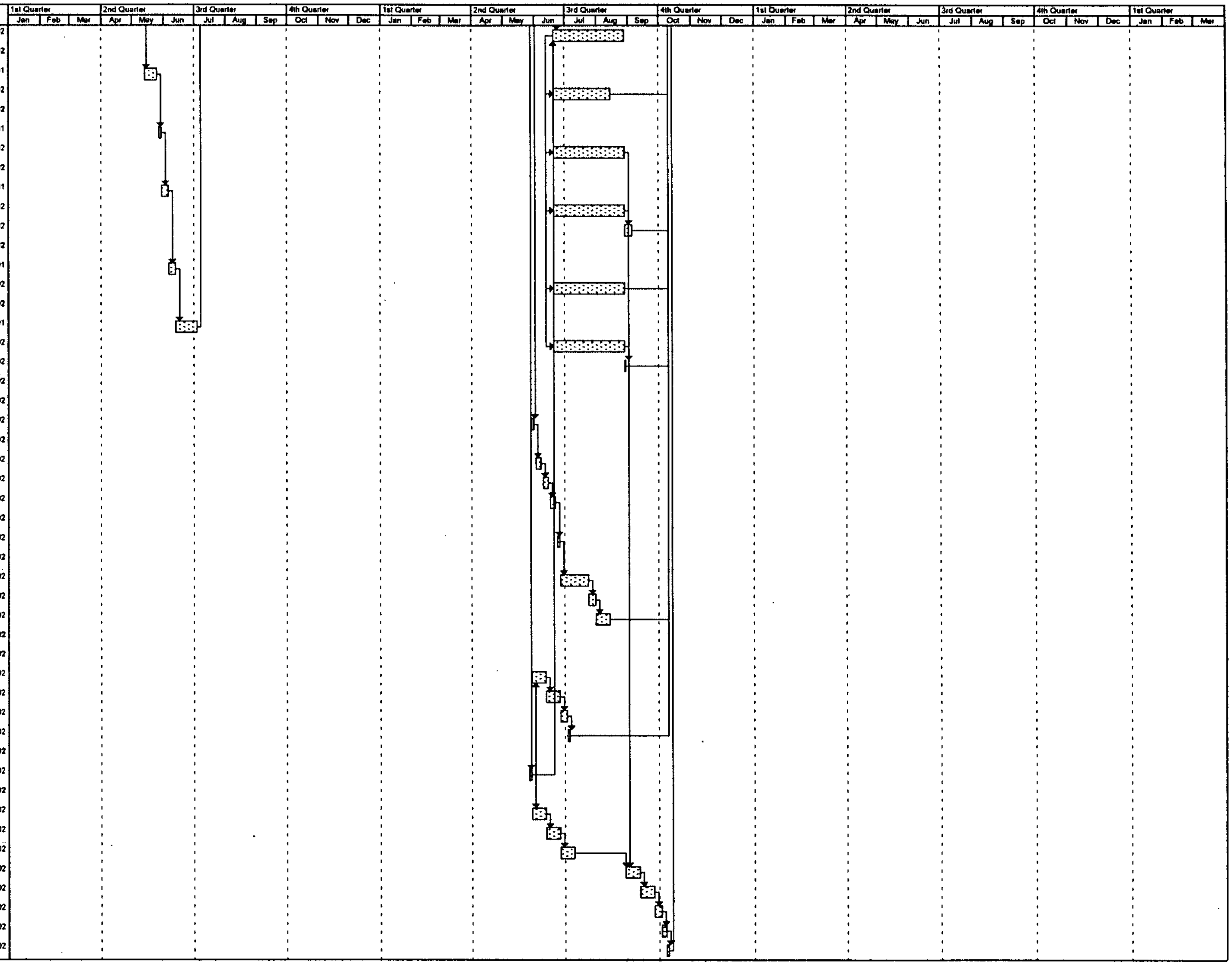
Construction Schedule for Embankment Dam Project

ID		Task Name	Duration	Start	Finish
1		Time Restrictions	52 wks	4/16/01	4/16/02
2		Project Construction Start	0 wks	4/15/01	4/15/01
3		First Winter Shut Down	0 wks	10/31/01	10/31/01
4		Second Season Start	0 wks	4/15/02	4/15/02
5					
6		RESERVOIRS	8 wks	4/15/02	6/7/02
7		CLEARING AND DEBRIS REMOVAL	8 wks	4/15/02	6/7/02
8		Clear, Grubb,Hvy Brush&Lgh Trees	8 wks	4/15/02	6/7/02
9		Clr,H-Brush W/Avg Grub,M/H-Trees	8 wks	4/15/02	6/7/02
10					
11		ACCESS ROADS	19 wks	4/16/01	8/24/01
12		ROADS	19 wks	4/16/01	8/24/01
13		FOREST ROAD, IMPROVE EXISTING (A)	18 wks	4/16/01	8/17/01
14		START WORK	0 wks	4/15/01	4/15/01
15		FOREST ROAD, PREP FOR SURFACING	2 wks	4/16/01	4/27/01
16		FOREST ROAD,CRUSHD SURFACING MAT	4 wks	4/30/01	5/25/01
17		FOREST ROAD, 4" BASE COURSE	7 wks	5/28/01	7/13/01
18		FOREST ROAD, 2" TOP COURSE	4 wks	7/23/01	8/17/01
19		NEW PERM SITE ACCESS ROADS (B)	16.5 wks	4/30/01	8/22/01
20		ACCESS ROAD,CRUSHD SURFACING MAT	2 wks	5/28/01	6/8/01
21		ACCESS ROAD, PREP FOR SURFACING	1 wk	4/30/01	5/4/01
22		ACCESS ROAD,CULVERTS-18"(5 EACH)	0.2 wks	5/7/01	5/7/01
23		ACCESS ROAD, 4" BASE COURSE	0.5 wks	7/16/01	7/18/01
24		ACCESS ROAD, 2" TOP COURSE	0.5 wks	8/20/01	8/22/01
25		NEW PERM-TO-TOP OF DAM A-ROAD (C)	16 wks	5/7/01	8/24/01
26		ACCESS ROAD,CRUSHD SURFACING MAT	1 wk	6/11/01	6/15/01
27		ACCESS ROAD, PREP FOR SURFACING	1 wk	5/7/01	5/11/01
28		ACCESS ROAD, 4" BASE COURSE	0.5 wks	7/18/01	7/20/01
29		ACCESS ROAD, 2" TOP COURSE	0.5 wks	8/22/01	8/24/01
30		FINISH WORK	0 wks	8/24/01	8/24/01
31					
32		DAMS (COMPACTED EARTH FILL)	82.7 wks	4/16/01	11/14/02
33		SITE PREP	82.7 wks	4/16/01	11/14/02
34		MOB., DEMOB., AND PREWORK	82.7 wks	4/16/01	11/14/02
35		Mob the first Season	4 wks	4/16/01	5/11/01
36		Demob the first Season	3 wks	7/4/01	7/25/01
37		Mob the Second Season	4 wks	4/15/02	5/10/02
38		Demob the Second Season	3 wks	10/24/02	11/14/02
39		STORAGE &PONDING OF CONSTR WATER	22.7 wks	5/13/02	10/17/02
40		Diversion Conduit Upper Dike	1 wk	5/13/02	5/17/02
41		Remove Diversion Upper Dike	1 wk	10/10/02	10/17/02
42		DIVERSION AND CARE OF WATER	22.7 wks	5/20/02	10/24/02
43		Diversion Conduit 48" Dia CMP	1 wk	5/20/02	5/24/02
44		Remove Diversion Upper Dike	1 wk	10/17/02	10/24/02
45		SITE ACCESS & HAUL ROADS	0.6 wks	5/27/02	5/29/02
46		Constr Road Grade Road Bed	0.5 wks	5/27/02	5/29/02
47		FOUNDATION WORK	3.2 wks	5/29/02	6/20/02
48		EXCAVATION,UNCLASF	0.6 wks	5/29/02	5/31/02
49		Excavation and Strip Foundation	0.5 wks	5/29/02	5/31/02
50		EXPLORATORY DRILLING	0.6 wks	6/3/02	6/5/02
51		Nx Exploratory Drilling	0.5 wks	6/3/02	6/5/02
52		PRESURE TESTING NX HOLE	0.2 wks	6/5/02	6/6/02
53		Presure Testing NX Hole	0.2 wks	6/5/02	6/6/02
54		FOUNDATION CLEANUP	0.8 wks	6/6/02	6/10/02
55		Foundation Cleanup	0.5 wks	6/6/02	6/10/02
56		FOUND.TREAT.DRILL GROUT CURTAIN	1 wk	6/11/02	6/17/02
57		Drill Foundation Grout Curtain	1 wk	6/11/02	6/17/02
58		DENTAL CONCRETE	0.6 wks	6/18/02	6/20/02
59		Dental Concrete	0.5 wks	6/18/02	6/20/02
60		COMPACTED EARTH DAM	68.7 wks	5/14/01	9/6/02
61		IMPERVIOUS CORE MATERIAL (CH)	10 wks	6/20/02	8/29/02



Construction Schedule for Embankment Dam Project

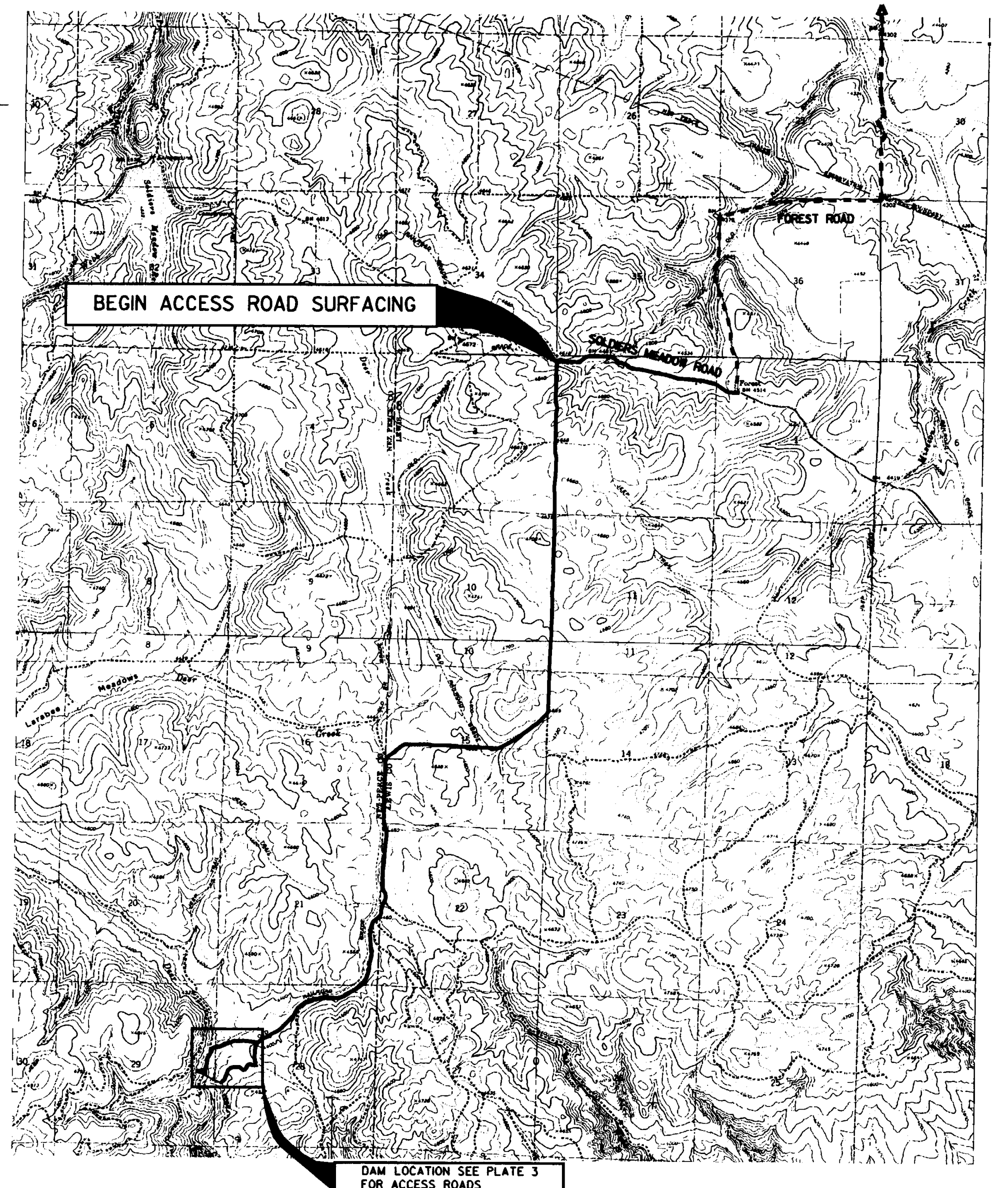
ID	Task Name	Duration	Start	Finish
62	Load, Haul, Place Impervious Mat	10 wks	6/20/02	8/29/02
63	**SAND FILTER, (10' THICK)**	**66.7 wks**	**5/14/01**	**8/15/02**
64	Crushing & Stockpile Materials	2 wks	5/14/01	5/25/01
65	Load, Haul & Place Sand Filter	8 wks	6/20/02	8/15/02
66	**COBBLE BEDDING,(6" THICK GRAVEL)**	**68.7 wks**	**5/28/01**	**8/29/02**
67	Crushing & Stockpile Materials	0.5 wks	5/28/01	5/30/01
68	Load, Haul & Place Gravel Filter	10 wks	6/20/02	8/29/02
69	**COBBLE 18"THICK SLOPE PROTECTION**	**66.2 wks**	**5/30/01**	**9/5/02**
70	Crushing & Stockpile Materials	1 wk	5/30/01	6/6/01
71	Load,Haul & Dumping Cobble Rocks	10 wks	6/20/02	8/29/02
72	Placing and Keying in Cobbles	1 wk	8/29/02	9/5/02
73	**RIPRAP BEDDING,(12"THICK GRAVEL)**	**64.2 wks**	**6/6/01**	**8/29/02**
74	Crushing & Stockpile Materials	1 wk	6/6/01	6/13/01
75	Load,Haul & Place Riprap Bedding	10 wks	6/20/02	8/29/02
76	**RIPRAP 30"THICK SLOPE PROTECTION**	**63.4 wks**	**6/13/01**	**8/30/02**
77	Crushing & Stockpile Materials	3 wks	6/13/01	7/4/01
78	Load, Haul & Dumping Riprap	10 wks	6/20/02	8/29/02
79	Placing and Keying in Riprap	0.2 wks	8/29/02	8/30/02
80	**SPILLWAY**	**11 wks**	**5/29/02**	**8/14/02**
81	**EXCAVATION,UNCLASF**	**0.5 wks**	**5/29/02**	**5/31/02**
82	Excavation and Strip Foundation	0.5 wks	5/29/02	5/31/02
83	**EXCAVATION,ROCK EXCAVATION**	**3 wks**	**6/3/02**	**6/21/02**
84	Rock, Drill, Shot & Producing	1 wk	6/3/02	6/7/02
85	Presplit Rock, Drill, & Shot	1 wk	6/10/02	6/14/02
86	Load & Haul Ripped &Blasted Rock	1 wk	6/17/02	6/21/02
87	**FOUNDATION CLEANUP**	**0.5 wks**	**6/24/02**	**6/26/02**
88	Foundation Cleanup	0.5 wks	6/24/02	6/26/02
89	**CONCRETE OVERFLOW SECTION**	**7 wks**	**6/26/02**	**8/14/02**
90	Concrete Overflow Section	4 wks	6/26/02	7/24/02
91	Concrete Retaining Walls' Slabs	1 wk	7/24/02	7/31/02
92	Concrete Retaining Walls	2 wks	7/31/02	8/14/02
93	**OUTLET WORKS**	**19.7 wks**	**5/27/02**	**10/10/02**
94	**CONCRETE OUTLET&IMPACT BASIN STR**	**5.5 wks**	**5/29/02**	**7/5/02**
95	Concr Impact Basin Slab	2 wks	5/29/02	6/12/02
96	Concr.Impact Basin Wall & Baffle	2 wks	6/12/02	6/26/02
97	Concr Impact Basin Precast Slab	1 wk	6/26/02	7/3/02
98	Outlet Channel Rip Rap,20" Thick	0.5 wks	7/3/02	7/5/02
99	**OUTLET CONDUIT (48" DIA. PIPE)**	**0.5 wks**	**5/27/02**	**5/29/02**
100	Outlet Conduit (48" Dia. Pipe)	0.5 wks	5/27/02	5/29/02
101	**INTAKE STRUCTURE**	**19.2 wks**	**5/29/02**	**10/10/02**
102	Intake Tower Foundation Slab	2 wks	5/29/02	6/12/02
103	Intake Tower Walls	2 wks	6/12/02	6/26/02
104	Intake Tower Elevated Slab	2 wks	6/26/02	7/10/02
105	Intake Gate Controller Slab	2 wks	8/29/02	9/12/02
106	Intake Tower Control Room	2 wks	9/12/02	9/26/02
107	Intake Tower Trashracks	1 wk	9/26/02	10/3/02
108	24"x 24" Slide Gate & Controller	0.5 wks	10/3/02	10/7/02
109	12" Dia. Vent Pipe	0.5 wks	10/8/02	10/10/02

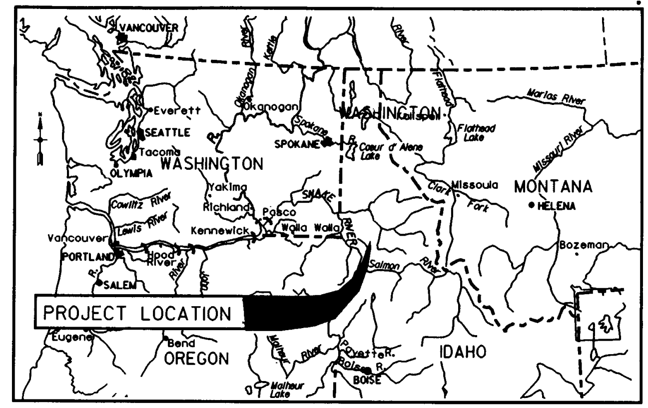


APPENDIX B

Plates

1. Location and Vicinity Maps and Index to Drawings
2. Reservoir Map - Plan
3. Location Map - Access Roads and Borrow Areas
4. Dam Foundation - Plan Profile and Section
5. Earth Embankment Dam - Plan
6. Earth Embankment Dam - Profile Section and Detail
7. Earth Embankment Dam - Low Level Outlet Tower
8. Earth Embankment Dam Spillway - Plan and Section
9. Earth Embankment Dam Spillway - Longitudinal Section
10. Roller Compacted Concrete Dam Intake Structure - Elevations, Sections and Details
11. Roller Compacted Concrete Dam - Plan and Section
12. Roller Compacted Concrete Dam and Spillway - Profile and Section
13. Impact Basin - Plan and Sections





VICINITY MAP

SCALE IN MILES

50 0 50 100 150

INDEX TO DRAWINGS

PLATE NO.	FILE NO.	TITLE
1	NPDC01.DGN	LOCATION AND VICINITY MAPS AND INDEX TO DRAWINGS
2	NPDC02.DGN	RESERVOIR MAP - PLAN
3	NPDC03.DGN	LOCATION MAP - ACCESS ROADS AND BORROW AREAS
4	NPDC04.DGN	DAM FOUNDATION - PLAN PROFILE AND SECTION
5	NPDC05.DGN	EARTH EMBANKMENT DAM - PLAN
6	NPDC06.DGN	EARTH EMBANKMENT DAM - PROFILE SECTION AND DETAIL
7	NPDC07.DGN	EARTH EMBANKMENT DAM - LOW LEVEL OUTLET TOWER
8	NPDC08.DGN	EARTH EMBANKMENT DAM SPILLWAY - PLAN AND SECTION
9	NPDC09.DGN	EARTH EMBANKMENT DAM SPILLWAY - LONGITUDINAL SECTION
10	NPDC10.DGN	ROLLER COMPACTED CONCRETE DAM INTAKE STRUCTURE - ELEVATIONS SECTIONS AND DETAILS
11	NPDC11.DGN	ROLLER COMPACTED CONCRETE DAM - PLAN AND SECTION
12	NPDC12.DGN	ROLLER COMPACTED CONCRETE DAM - PROFILE AND SECTION
13	NPDC13.DGN	IMPACT BASIN - PLAN AND SECTIONS

SCALE IN FEET
2000' 0 2000'

COMPUTER AIDED DESIGN & DRAFTING

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

ASTON
QRTH
TATRO

DEER CREEK DAM

DAM ALTERNATIVES STUDY

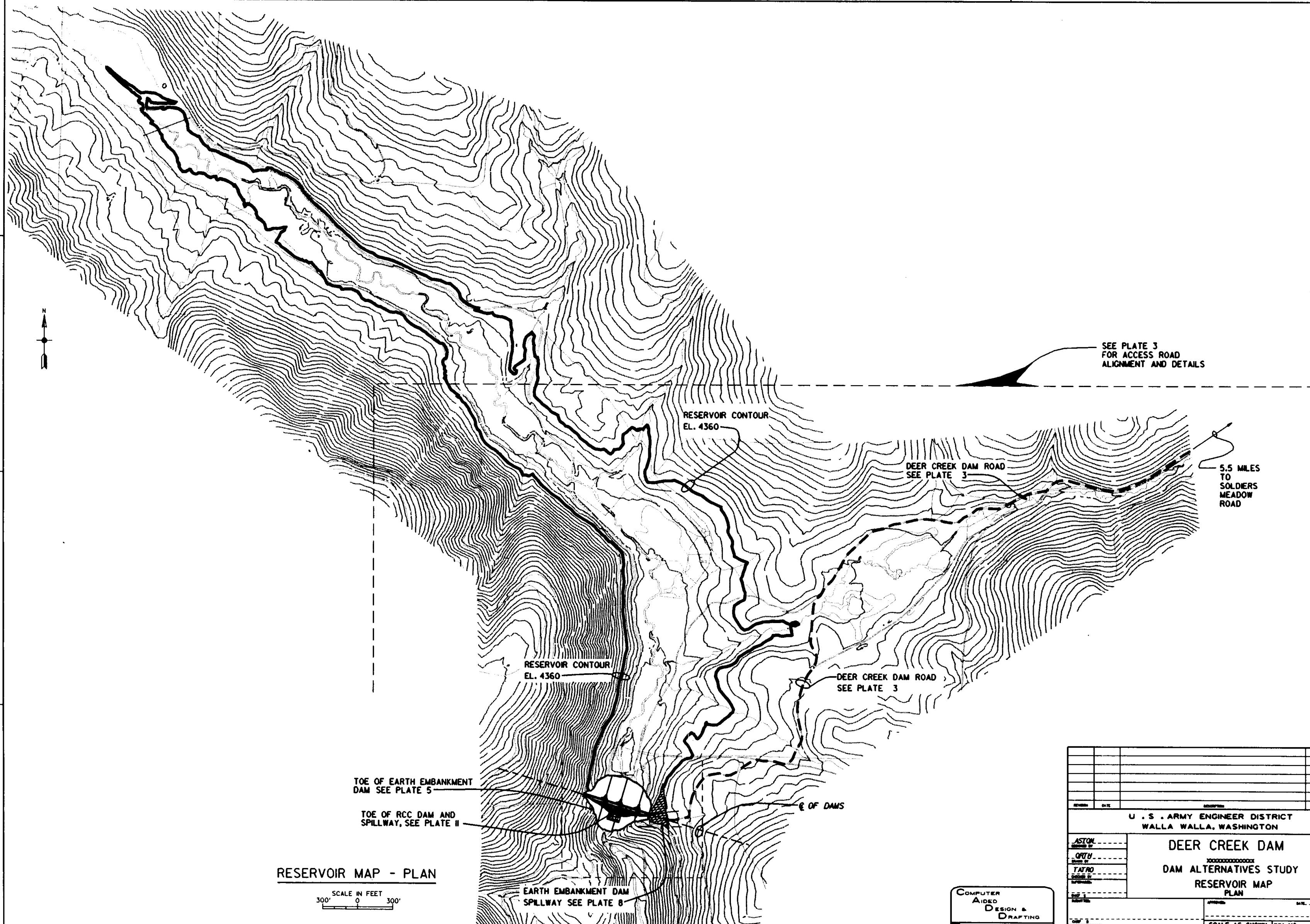
LOCATION AND VICINITY MAPS
AND INDEX TO DRAWINGS

SCALE AS SHOWN | INV. NO.

N PLATE - 1

REFERENCE FILES ATTACHED YES NO LEVELS ON FOR CONTRACT DRWGS S SCALE S L:\cad\npdc\npdc01.dgn 14-APR-1999 10:23

CORPS OF ENGINEERS | SAFETY PAYS | U. S. ARMY



RESERVOIR MAP - PLAN

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

DEER CREEK DAM

XXXXXXXXXXXXX

DAM ALTERNATIVES STUDY

RESERVOIR MAP

PLAN

ASTON

ORTH

TATRO

SCALE AS SHOWN | INV. NO.

PLATE - 2

COMPUTER AIDED DESIGN & DRAFTING

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VALUE ENGINEERING PAYS

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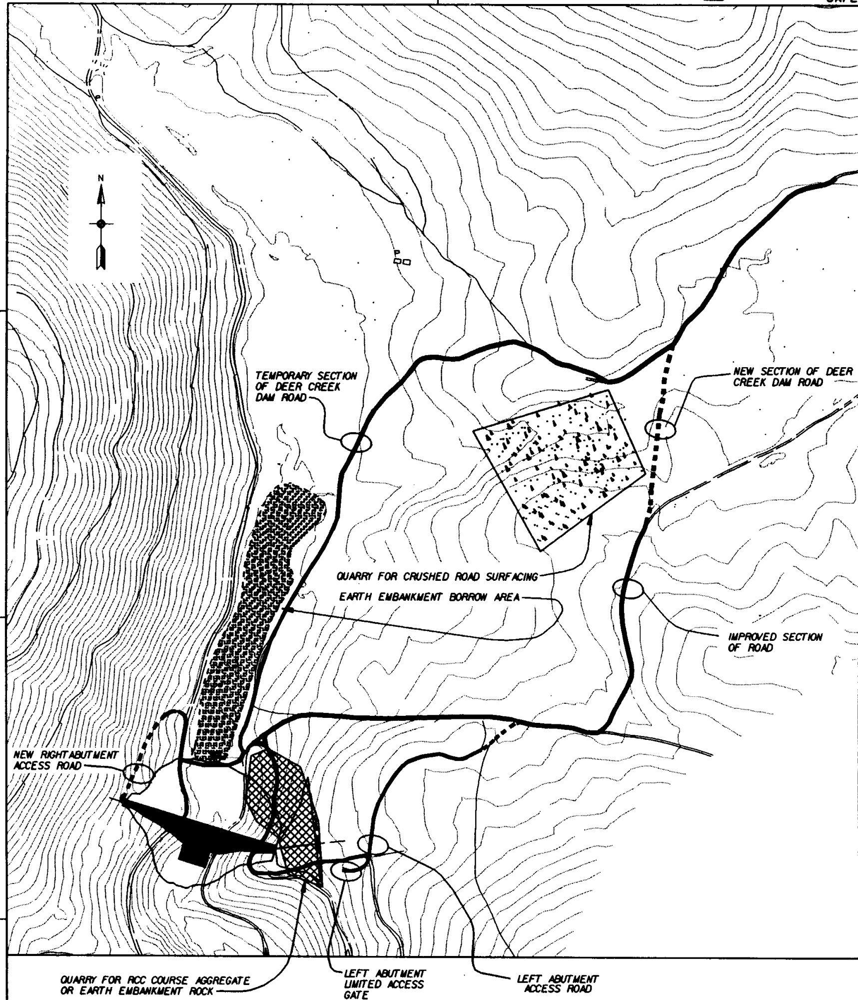
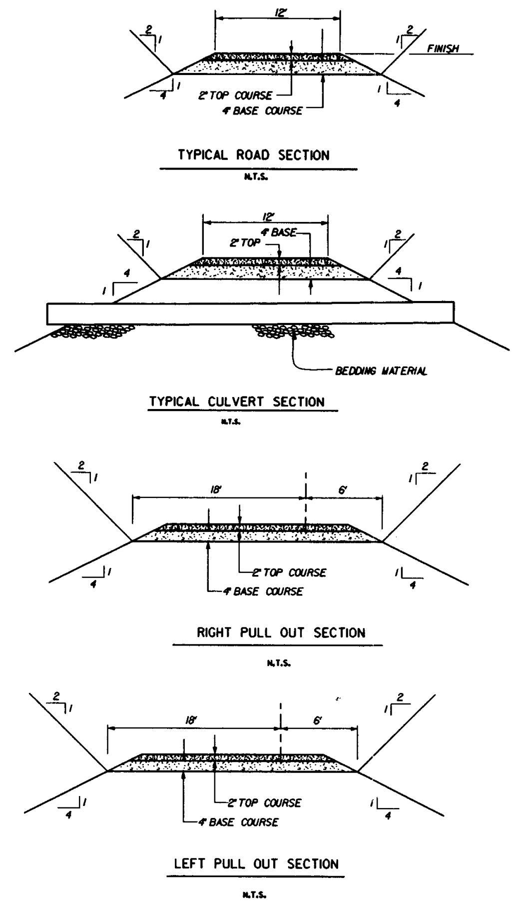
CORPS OF ENGINEERS — SAFETY PAYS — U. S. ARMY



LOCATION MAP - ACCESS ROADS AND BORROW AREAS

SCALE IN FEET
200' 0 200'



LEGEND

- QUARRY FOR CRUSHED ROAD SURFACING
- EARTH EMBANKMENT BORROW AREA
- QUARRY FOR RCC COURSE AGGREGATE OR EARTH EMBANKMENT ROCK
- IMPROVED SECTION OF ROAD
- NEW SECTION OF DEER CREEK DAM ROAD

COMPUTER AIDED DESIGN & DRAFTING
/usr9/cad/npdc/npdc03.dgn

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

ASTON
ORTH
TATRO
WELLER

DEER CREEK DAM
DAM ALTERNATIVES STUDY
LOCATION MAP
ACCESS ROADS AND BORROW AREAS

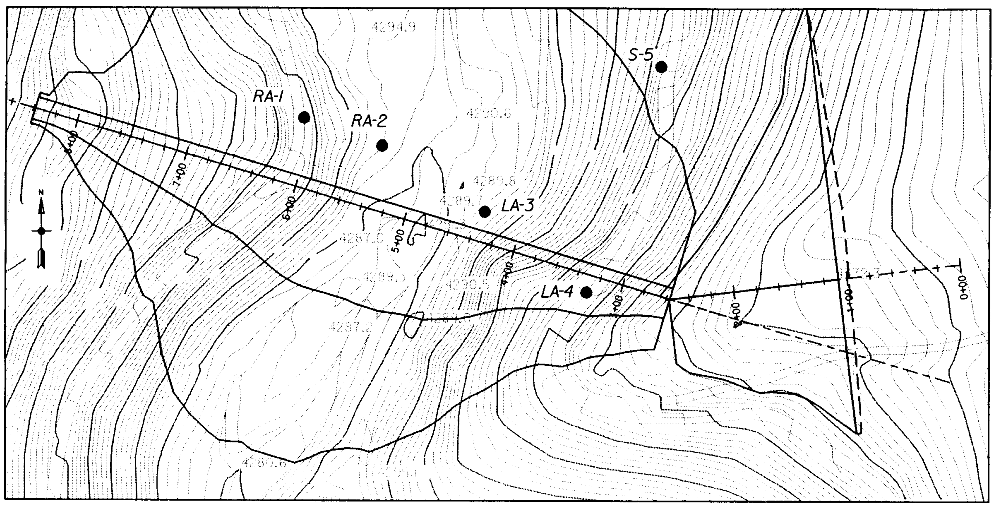
SCALE AS SHOWN | INV. NO.
N | PLATE - 3

VALUE ENGINEERING PAYS

YES NO — REFERENCE FILES ATTACHED — LEVELS ON FOR CONTRACT DRWGS — SCALE /usr9/cad/npdc/npdc03.dgn 15-APR-1999 09:14

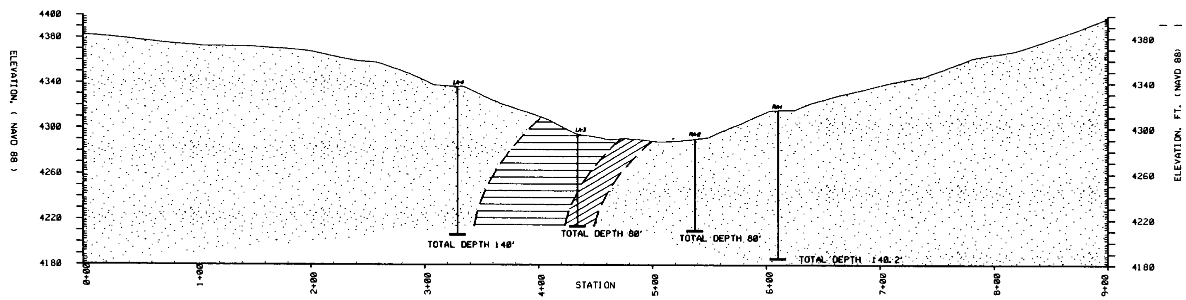
ACCESS ROAD

CORPS OF ENGINEERS | SAFETY PAYS | U. S. ARMY



PLAN

SCALE IN FEET 40' 0 40'

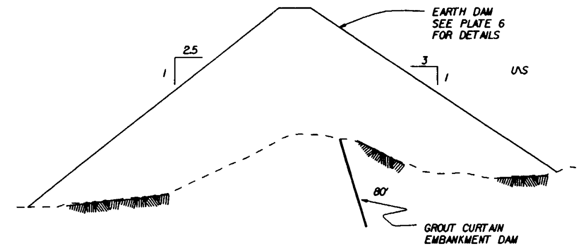


PROFILE - DAM CENTERLINE

NOTES:
CORE HOLES ARE PROJECTED ONTO PROFILE

LEGEND

- ● EXPLORATION CORE HOLES
- — — APPOXIMATE CONTACT BETWEEN UNITS
- ALRERED ANDESITE
- ANDESITE CATACLASITE
- ALRERED QUARTZ DIORITE

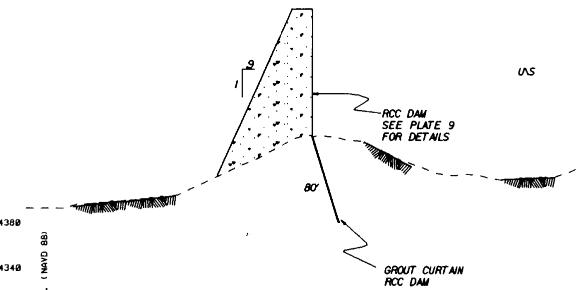


SECTION

SECTION TAKEN AT STA. 5+00 OF ℄ DAM ALIGNMENT

HORIZONTAL SCALE IN FEET 40' 0 40'

VERTICAL SCALE IN FEET 20' 0 20'



SECTION

SECTION TAKEN AT STA. 5+00 OF ℄ DAM ALIGNMENT

HORIZONTAL SCALE IN FEET 40' 0 40'

VERTICAL SCALE IN FEET 20' 0 20'

COMPUTER AIDED DESIGN & DRAFTING
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14-APR-1999 15:28

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

HARRISON
ORTH
TATRO

DEER CREEK DAM
DAM ALTERNATIVES STUDY
DAM FOUNDATION
PLAN PROFILE AND SECTION

SCALE AS SHOWN | INV. NO.
N | PLATE - 4

VALUE ENGINEERING PAYS

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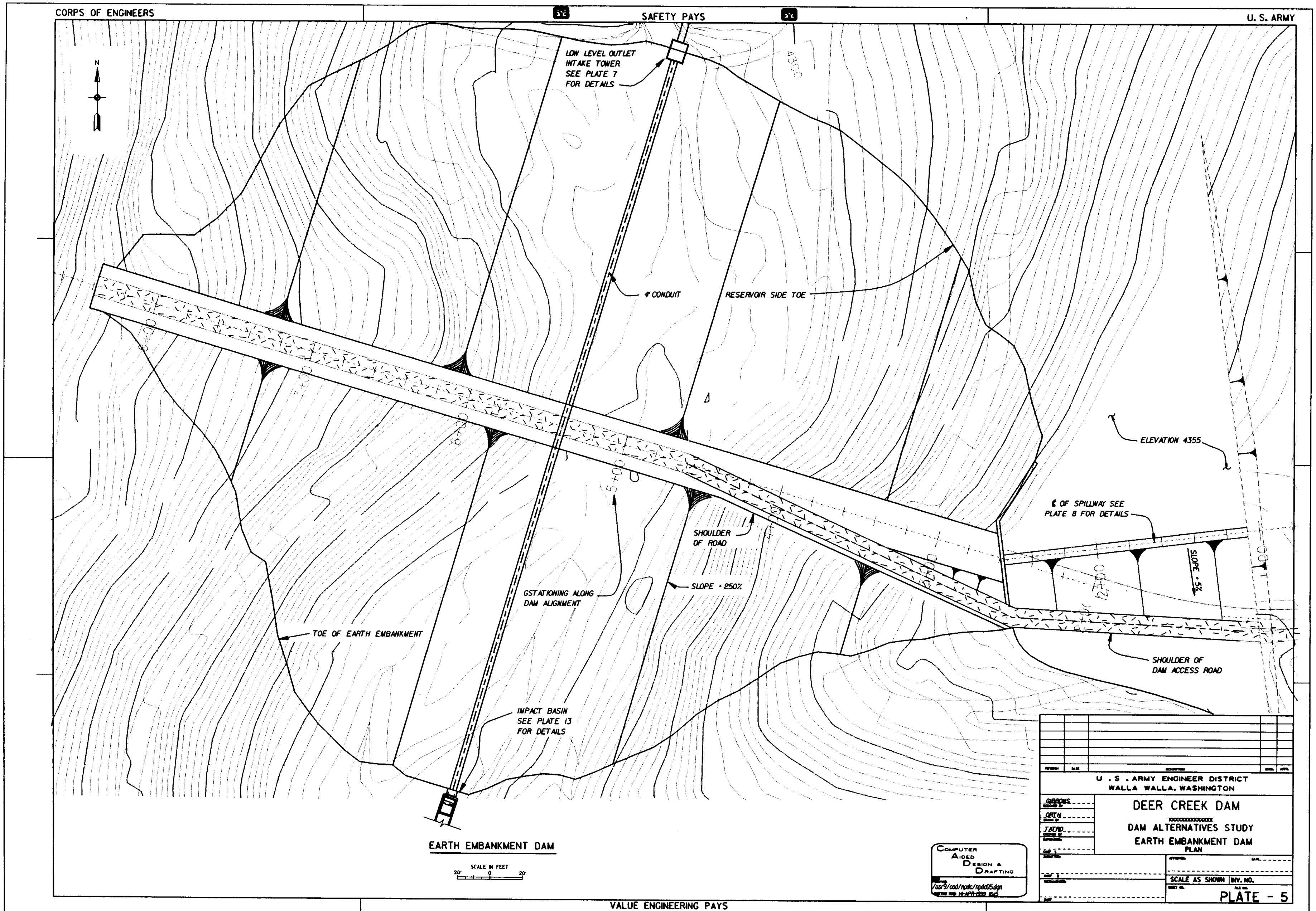

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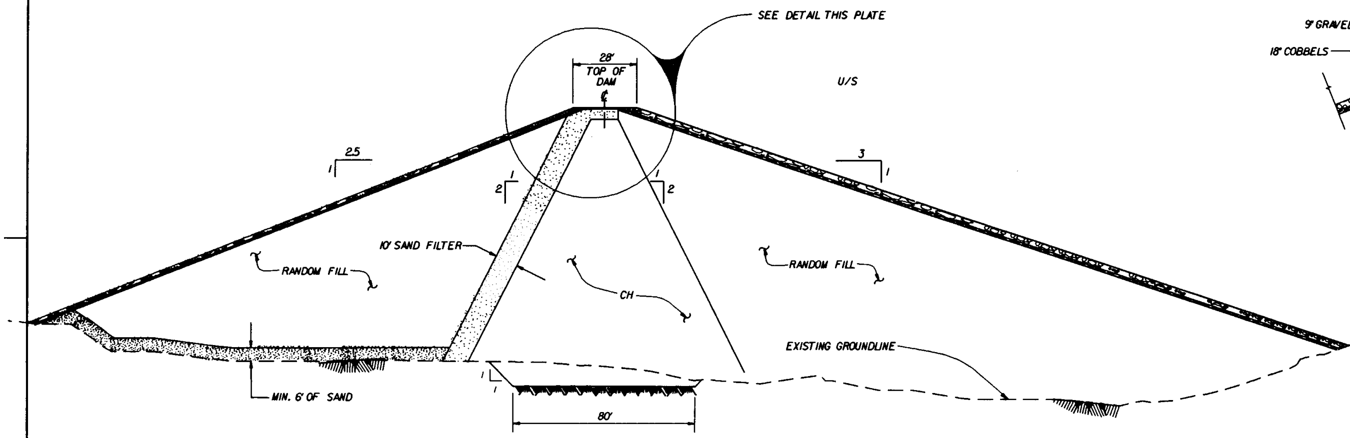
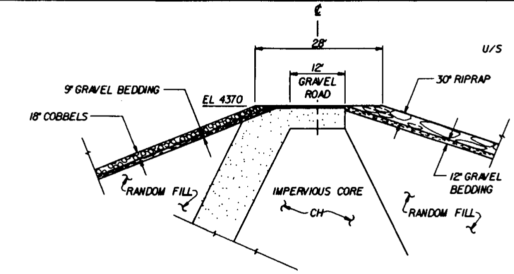
CORPS OF ENGINEERS — SAFETY PAYS — U. S. ARMY



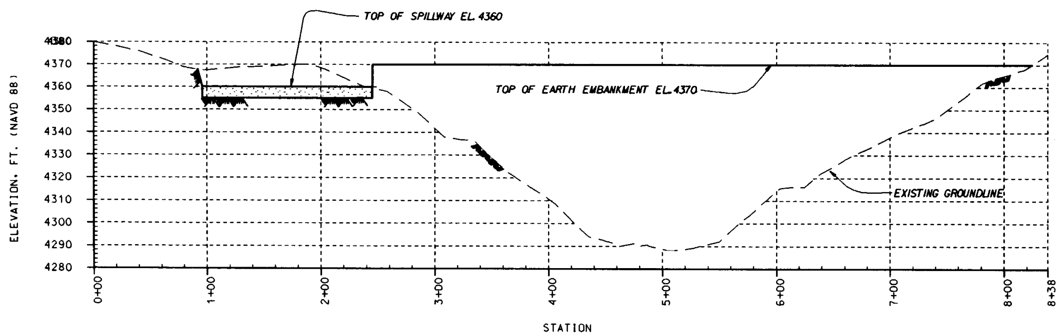
SECTION - EARTH EMBANKMENT (TYP.)

SCALE IN FEET 20' 0 20'



DETAIL - EARTH EMBANKMENT

SCALE IN FEET 10' 0 10'



PROFILE - EARTH EMBANKMENT

NOTE: VERTICAL SCALE EXAGGERATED

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

TATRO
ORTH
KATZ

DEER CREEK DAM

DAM ALTERNATIVES STUDY

EARTH EMBANKMENT DAM
PROFILE SECTION AND DETAIL

SCALE AS SHOWN | INV. NO.

PLATE - 6

COMPUTER AIDED DESIGN & DRAFTING
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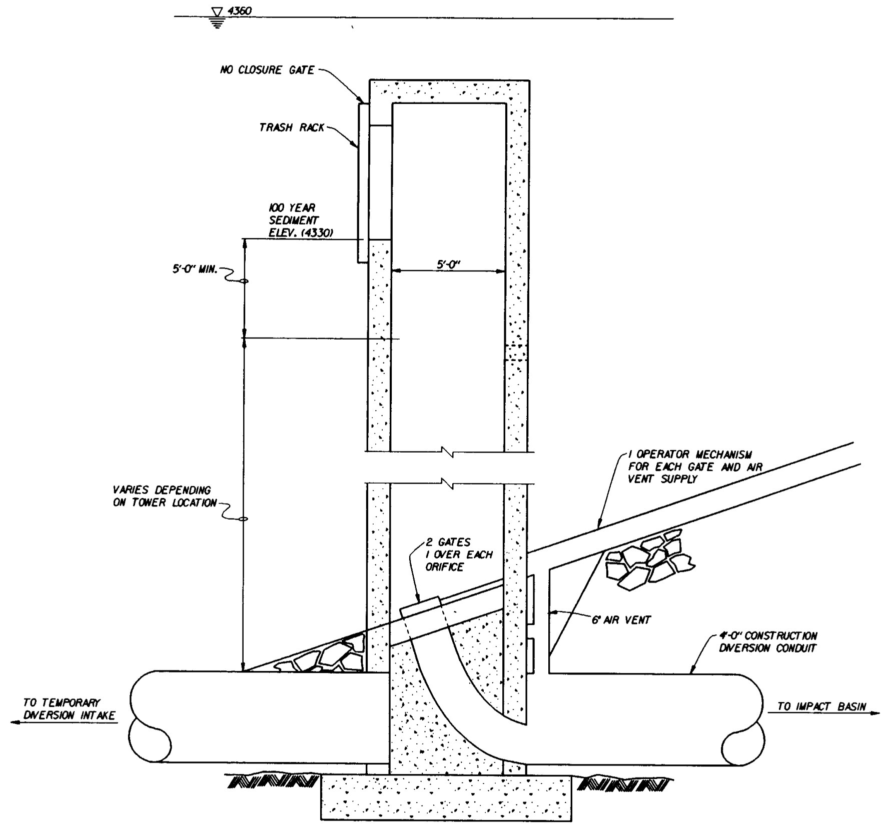
VALUE ENGINEERING PAYS

REFERENCE FILES ATTACHED — LEVELS ON FOR CONTRACT DRWGS $ — SCALE $ /usr9/cad/npdc/npdc06.dgn 15-APR-1999 09:16



LOW LEVEL OUTLET INTAKE TOWER

NOT TO SCALE

COMPUTER AIDED DESIGN & DRAFTING
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U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

KATZ
SHENEFIELD

DEER CREEK DAM

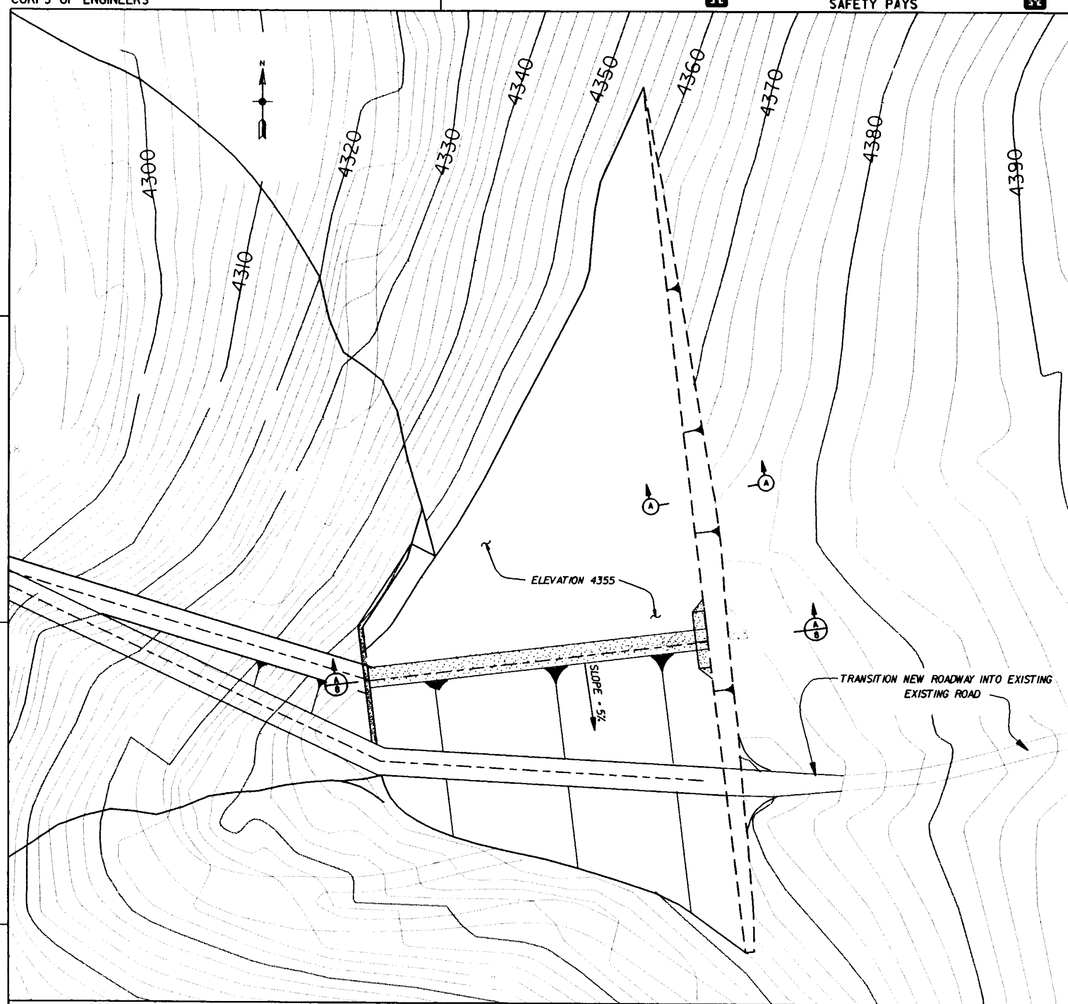
DAM ALTERNATIVES STUDY
EARTH EMBANKMENT DAM
LOW LEVEL OUTLET TOWER

SCALE AS SHOWN | INV. NO.

7 PLATE - 7

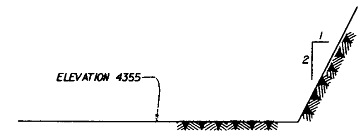
REFERENCE FILES ATTACHED YES LEVELS ON FOR CONTRACT DRWGS SCALE 1:8 /usr9/cad/npdc/npdc07.dgn 15-APR-1999 08:30

CORPS OF ENGINEERS — SAFETY PAYS — U. S. ARMY



EARTH EMBANKMENT SPILLWAY - PLAN

SCALE IN FEET 20' 0 20'



SECTION - A

SCALE IN FEET 20' 0 20'

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14-APR-1999 13:39

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

GIBBON
ORTH
TATRO

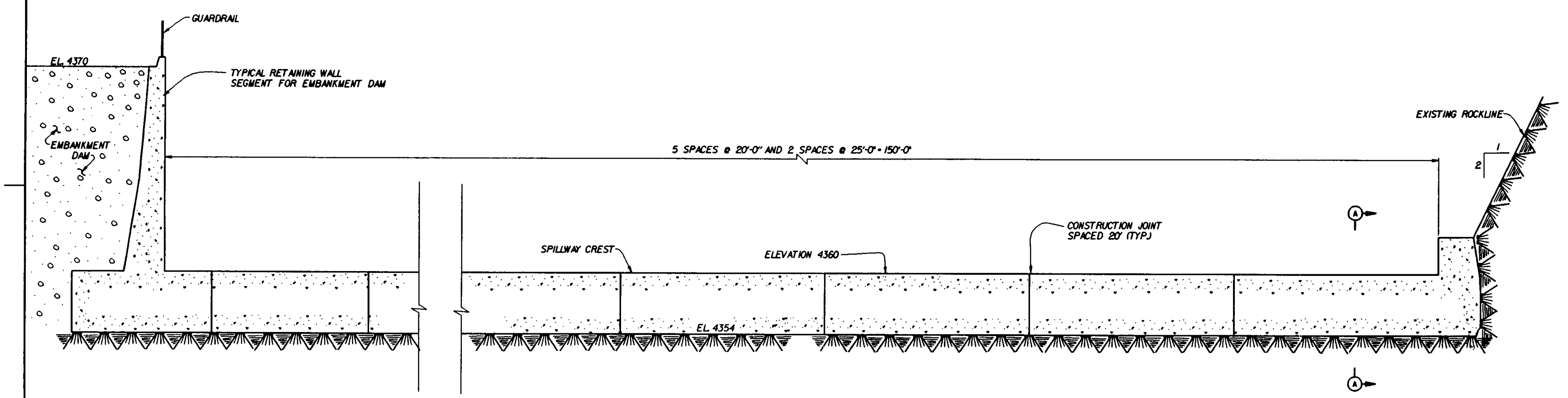
DEER CREEK DAM
xxxxxxxxxxxxxx
DAM ALTERNATIVES STUDY
EARTH EMBANKMENT DAM SPILLWAY
PLAN AND SECTION

SCALE AS SHOWN | INV. NO.

PLATE - 8

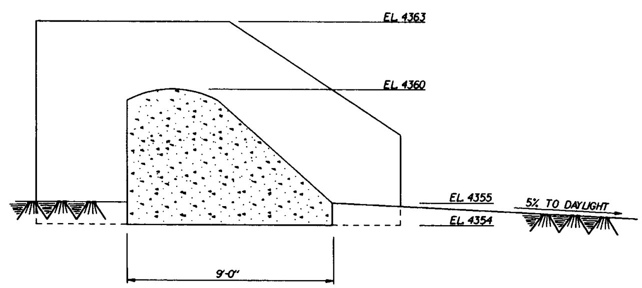
VALUE ENGINEERING PAYS

REFERENCE FILES ATTACHED YES NO — LEVELS ON FOR CONTRACT DRWGS $ — SCALE $ /usr9/cad/npdc/npdc08.dgn 14-APR-1999 13:39



LONGITUDINAL SECTION A THRU SPILLWAY
8

SCALE IN FEET 12' 0 5'



SECTION A-A THRU SPILLWAY CREST

SCALE IN FEET 2' 0 2'

COMPUTER AIDED DESIGN & DRAFTING

L:\cad\npdc\npdc09.dgn 14-APR-1999 09:35

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

TATRO
SHENEFIELD
KATZ

DEER CREEK DAM

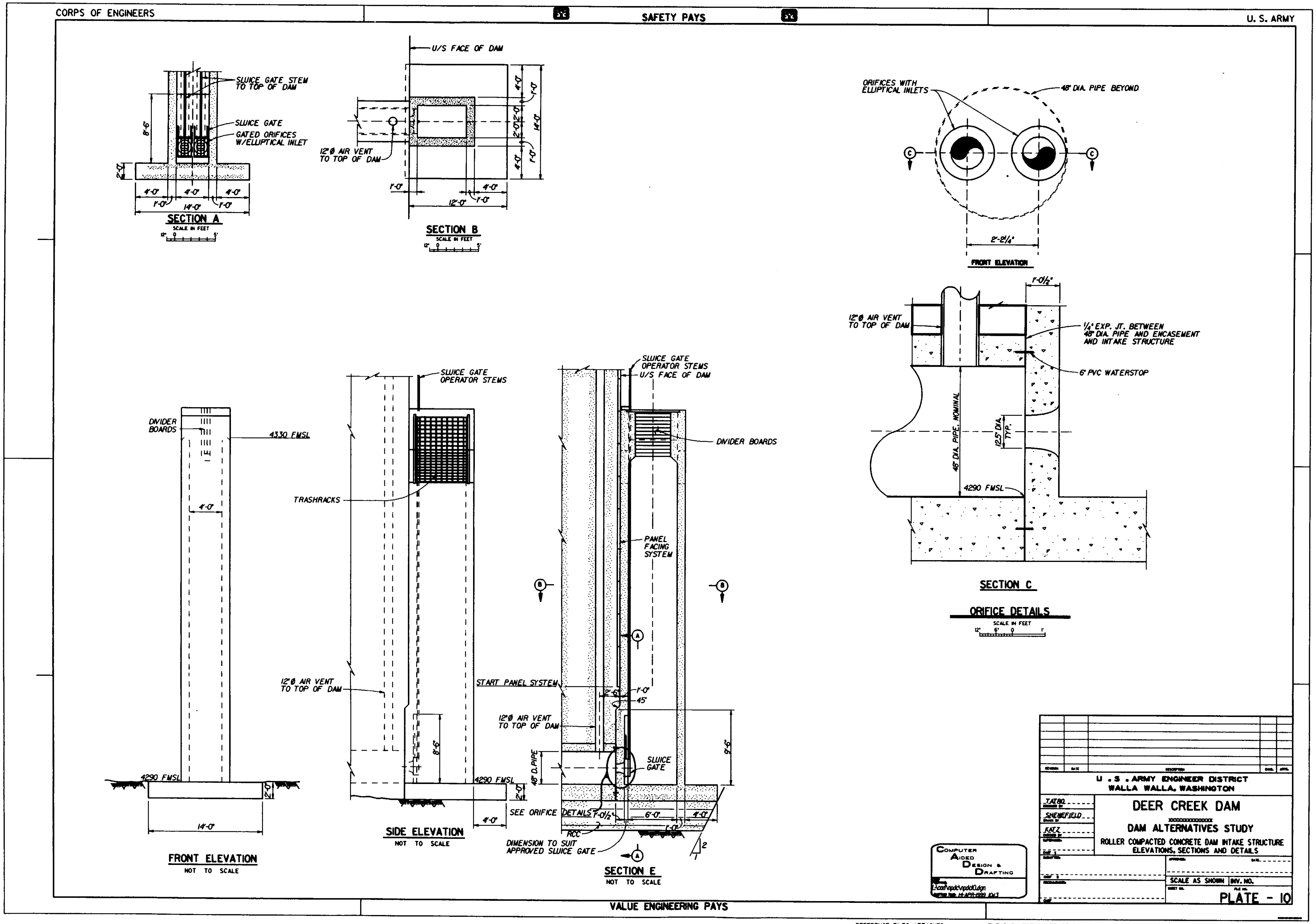
DAM ALTERNATIVES STUDY

EARTH EMBANKMENT DAM SPILLWAY
LONGITUDINAL SECTION

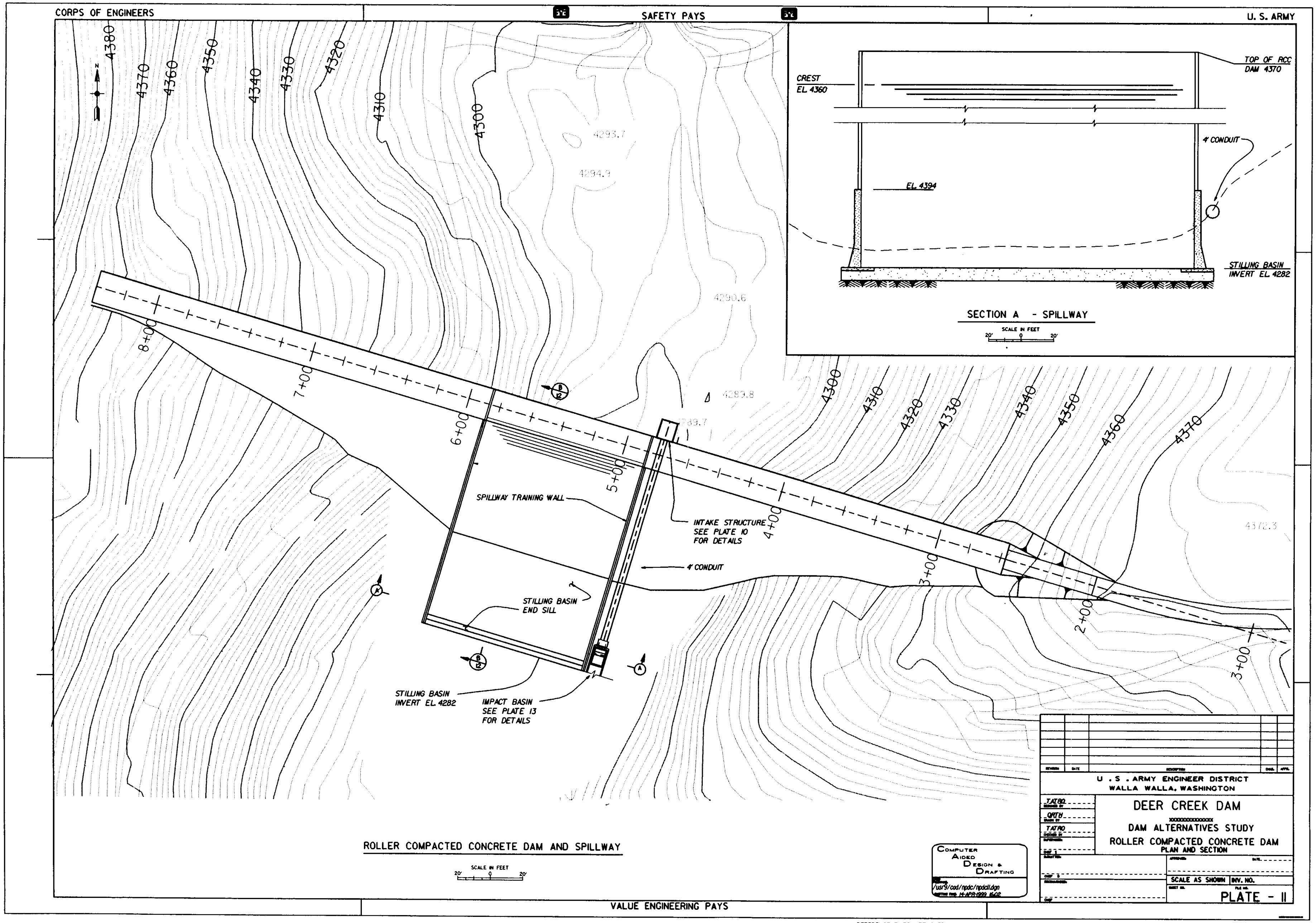
SCALE AS SHOWN | INV. NO.

PLATE - 9

REFERENCE FILES ATTACHED YES   LEVELS ON FOR CONTRACT DRWGS   SCALE 1:8   L:\cad\npdc\npdc09.dgn 14-APR-1999 09:36



CORPS OF ENGINEERS
SAFETY PAYS
U. S. ARMY
SLUICE GATE STEM TO TOP OF DAM
SLUICE GATE
GATED ORIFICES W/ELLIPTICAL INLET
SECTION A
SCALE IN FEET
U/S FACE OF DAM
12"Ø AIR VENT TO TOP OF DAM
SECTION B
SCALE IN FEET
ORIFICES WITH ELLIPTICAL INLETS
48" DIA. PIPE BEYOND
FRONT ELEVATION
1/4" EXP. JT. BETWEEN 48" DIA. PIPE AND ENCASEMENT AND INTAKE STRUCTURE
6" PVC WATERSTOP
48" DIA. PIPE, NOMINAL
12.5" DIA. TYP.
4290 FMSL
SECTION C
ORIFICE DETAILS
SCALE IN FEET
DIVIDER BOARDS
4330 FMSL
4290 FMSL
FRONT ELEVATION
NOT TO SCALE
SLUICE GATE OPERATOR STEMS
TRASHRACKS
12"Ø AIR VENT TO TOP OF DAM
SIDE ELEVATION
NOT TO SCALE
SLUICE GATE OPERATOR STEMS
U/S FACE OF DAM
PANEL FACING SYSTEM
START PANEL SYSTEM
SLUICE GATE
48" D.PIPE
SEE ORIFICE DETAILS
RCC
DIMENSION TO SUIT APPROVED SLUICE GATE
SECTION E
NOT TO SCALE
U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON
DEER CREEK DAM
DAM ALTERNATIVES STUDY
ROLLER COMPACTED CONCRETE DAM INTAKE STRUCTURE
ELEVATIONS, SECTIONS AND DETAILS
TATRO
SHEWFIELD
KATZ
SCALE AS SHOWN
INV. NO.
PLATE - 10
COMPUTER AIDED DESIGN & DRAFTING
VALUE ENGINEERING PAYS
REFERENCE FILES ATTACHED
YES
LEVELS ON FOR CONTRACT DRWGS
YES
SCALE 1:8
L:\cad\npdc\npdc10.dgn
14-APR-1999 10:13



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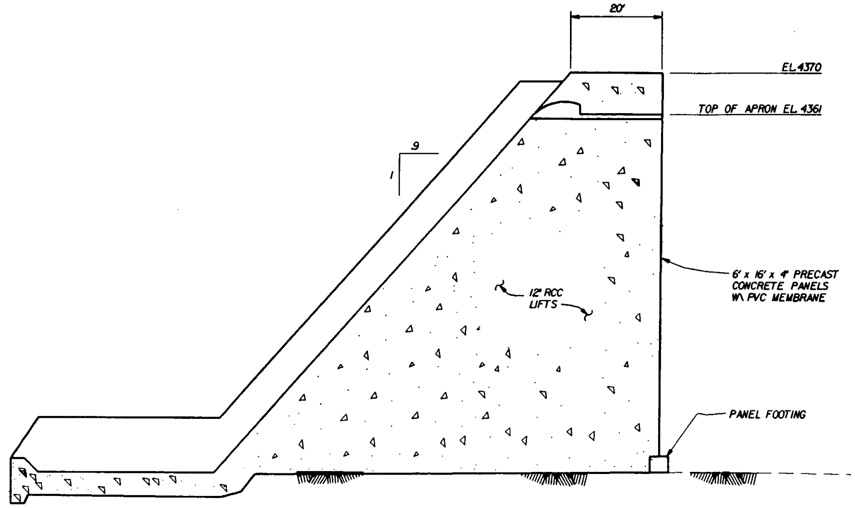
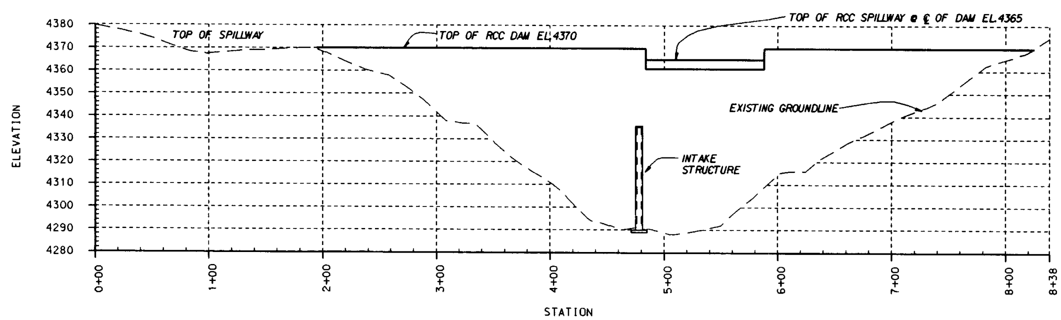
CORPS OF ENGINEERS | SAFETY PAYS | U. S. ARMY



SECTION B - ROLLER COMPACTED CONCRETE DAM
12

SCALE IN FEET 10' 0 10'



UPSTREAM PROFILE - ROLLER COMPACTED CONCRETE DAM

COMPUTER AIDED DESIGN & DRAFTING
/usr9/cad/npdc/npdcl2.dgn

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

TATRO
ORTH
KATZ

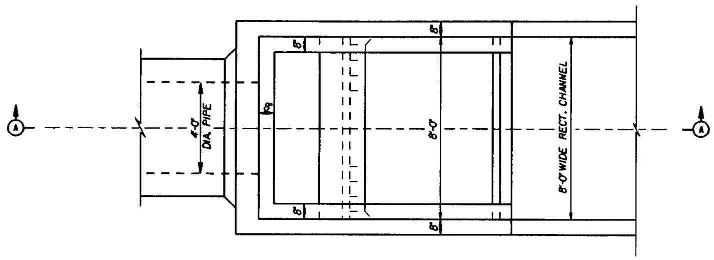
DEER CREEK DAM
DAM ALTERNATIVES STUDY
ROLLER COMPACTED CONCRETE DAM AND SPILLWAY
PROFILE AND SECTION

SCALE AS SHOWN | INV. NO.
N | PLATE - 12

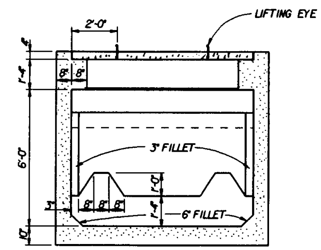
VALUE ENGINEERING PAYS

REFERENCE FILES ATTACHED | LEVELS ON FOR CONTRACT DRWGS S | SCALE S | /usr9/cad/npdc/npdcl2.dgn 15-APR-1999 09:04

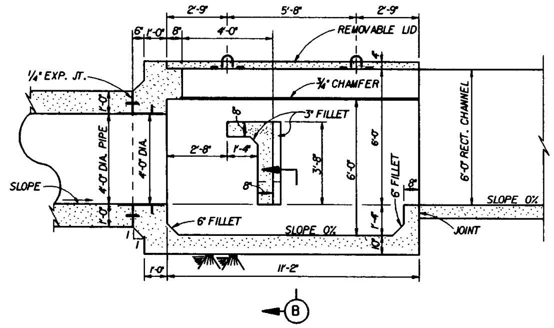
CORPS OF ENGINEERS | SAFETY PAYS | U. S. ARMY



PLAN
(LID NOT SHOWN FOR CLARITY)
SCALE IN FEET



SECTION B
SCALE IN FEET



SECTION A
SCALE IN FEET

COMPUTER AIDED DESIGN & DRAFTING
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U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

TATRO
SHENEFIELD
KATZ

DEER CREEK DAM

DAM ALTERNATIVES STUDY

IMPACT BASIN
PLAN AND SECTIONS

SCALE AS SHOWN | INV. NO.

PLATE - 13

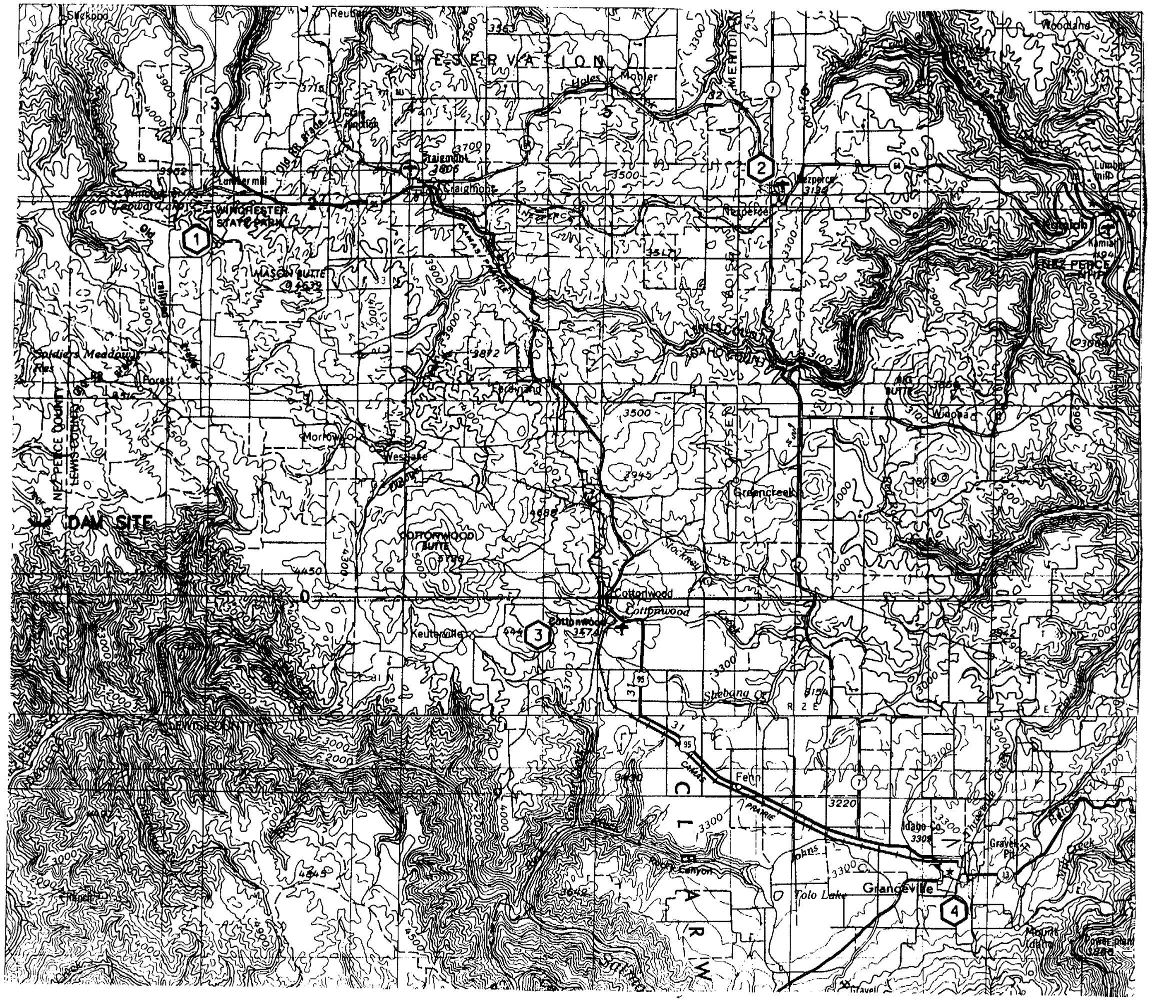
VALUE ENGINEERING PAYS

REFERENCE FILES ATTACHED YES | LEVELS ON FOR CONTRACT DRWGS | SCALE 1:8 | /usr9/cad/npdc/npdc13.dgn 15-APR-1999 09:19

APPENDIX C

Maps

1. Gage Locations
2. Drainage Basin Map
3. Inundation Map



NOTE:

THIS MAPPING IS TAKEN FROM UNITED STATES GEOLOGICAL SURVEY MAPS GRANGEVILLE, IDAHO; WASHINGTON, 1955, REVISED 1979 AND PULLMAN, WASHINGTON; IDAHO, 1955, REVISED 1974.

LEGEND

NUMBER	DESCRIPTION
1	WINCHESTER
2	NEZPERCE
3	COTTONWOOD 2 WSW
4	GRANGEVILLE
1 (hexagon)	GAGE LOCATION

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

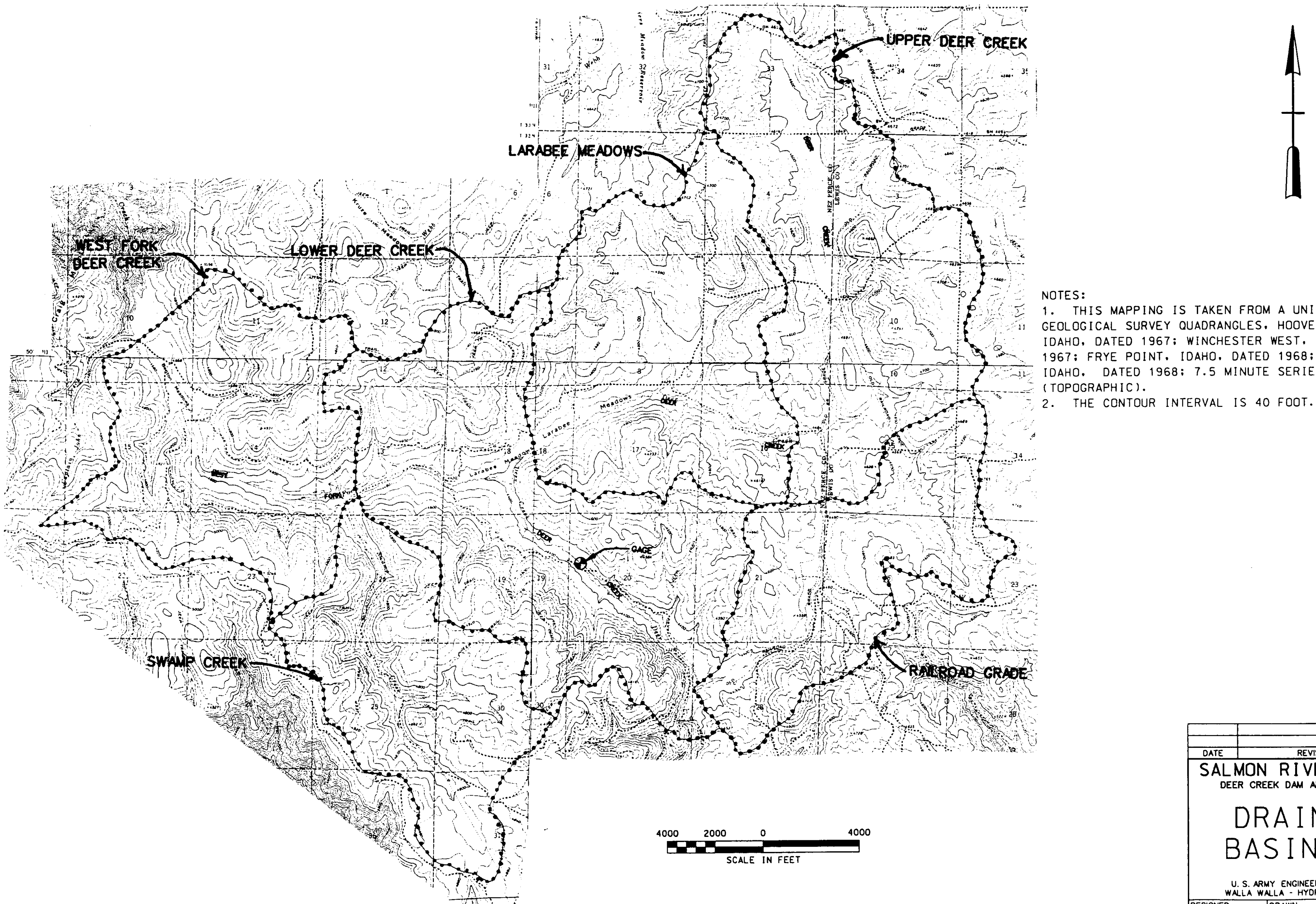
GAGE LOCATIONS

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00614

MAP 1



NOTES:
1. THIS MAPPING IS TAKEN FROM A UNITED STATES GEOLOGICAL SURVEY QUADRANGLES, HOOVER POINT, IDAHO, DATED 1967; WINCHESTER WEST, IDAHO, DATED 1967; FRYE POINT, IDAHO, DATED 1968; AND WAHA, IDAHO. DATED 1968; 7.5 MINUTE SERIES (TOPOGRAPHIC).
2. THE CONTOUR INTERVAL IS 40 FOOT.

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

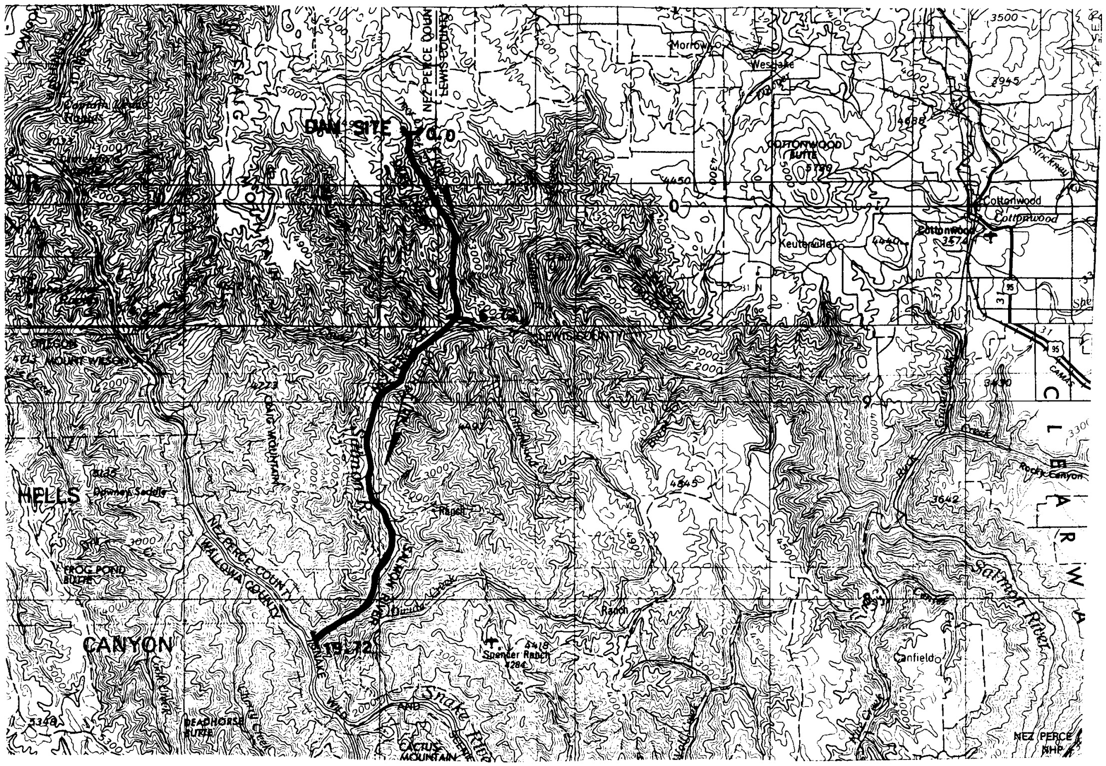
DRAINAGE
BASIN MAP

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00615

MAP 2



5	0	5

SCALE IN MILES

NOTES:

1. THIS MAPPING IS TAKEN FROM UNITED STATES GEOLOGICAL SURVEY MAPS GRANGEVILLE, IDAHO; WASHINGTON, 1955, REVISED 1979 AND PULLMAN, WASHINGTON; IDAHO, 1955, REVISED 1974.

2. THE LOCATIONS OF THREE OF THE TWENTY-SEVEN CROSS SECTIONS USED IN THE DAM BREAK MODEL ARE SHOWN ON THIS MAP. THE CROSS SECTIONS ARE LOCATED AT THE DAM, 6.72 MILES AND 19.72 MILES DOWNSTREAM FROM THE DAM, RESPECTIVELY. CROSS SECTION GEOMETRY WAS ESTIMATED FROM USGS 7.5 MINUTE QUADRANGLE MAPS; CONTOUR INTERVAL FORTY FEET. THE MAXIMUM STAGE OF THE DAM BREAK FLOOD WAVE IS SLIGHTLY IN EXCESS OF FORTY FEET AT EACH LOCATION; THE ASSOCIATED TOP WIDTH VARIES FROM APPROXIMATELY 200 TO 300 FEET. THE NARROW STEEP VALLEYS OF DEER CREEK AND THE SALMON RIVER IN THE REACH SHOWN PRECLUDE SHOWING A DETAILED INUNDATION MAP ON 7.5 MINUTEE QUADRANGLE MAPS. THEREFORE 1:250,000 SCALE MAPS ARE USED TO SHOW CROSS SECTION LOCATION ONLY.

LEGEND

	DAM SITE
19.72	MILES FROM DAM
	FLOODPLAIN

DATE	REVISION	BY
15 APR 99	ADDED LEGEND AND FLOODPLAIN	JCM

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

INUNDATION MAP

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00616

MAP 3

APPENDIX D

Charts

1. Annual Peak Discharge, Frequency Curve
2. 30 Minute Unit Hydrograph - West Fork Deer Creek
3. 30 Minute Unit Hydrograph - Larabee Meadows
4. 30 Minute Unit Hydrograph - Upper Deer Creek
5. 30 Minute Unit Hydrograph - Swamp Creek
6. 30 Minute Unit Hydrograph - Lower Deer Creek
7. 30 Minute Unit Hydrograph - Rail Road Grade
8. Probable Maximum Flood (PMF) and One Half PMF
9. Storage vs. Elevation Curve
10. Drawdown Curve
11. Flow Duration Curve April through July
12. Dam Break Analysis Cross Section at Dam Site (Cross Section 0.00)
13. Dam Break Analysis Cross Section at Mouth of Deer Creek (Cross Section 6.72)
14. Dam Break Analysis Cross Section at Mouth of Salmon River (Cross Section 19.72)
15. Tailwater Rating Curve
16. RCC Dam
17. Embankment Dam

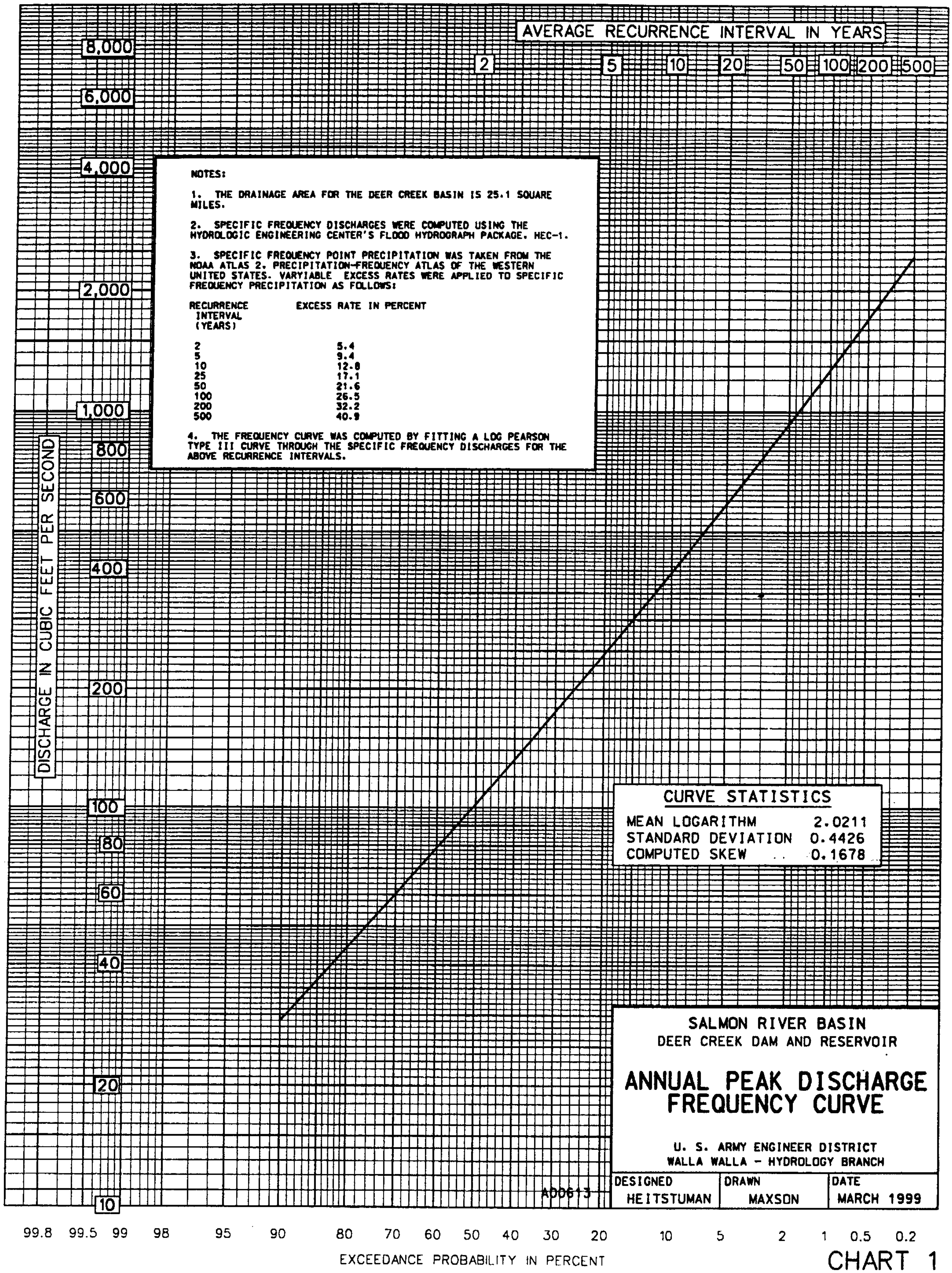
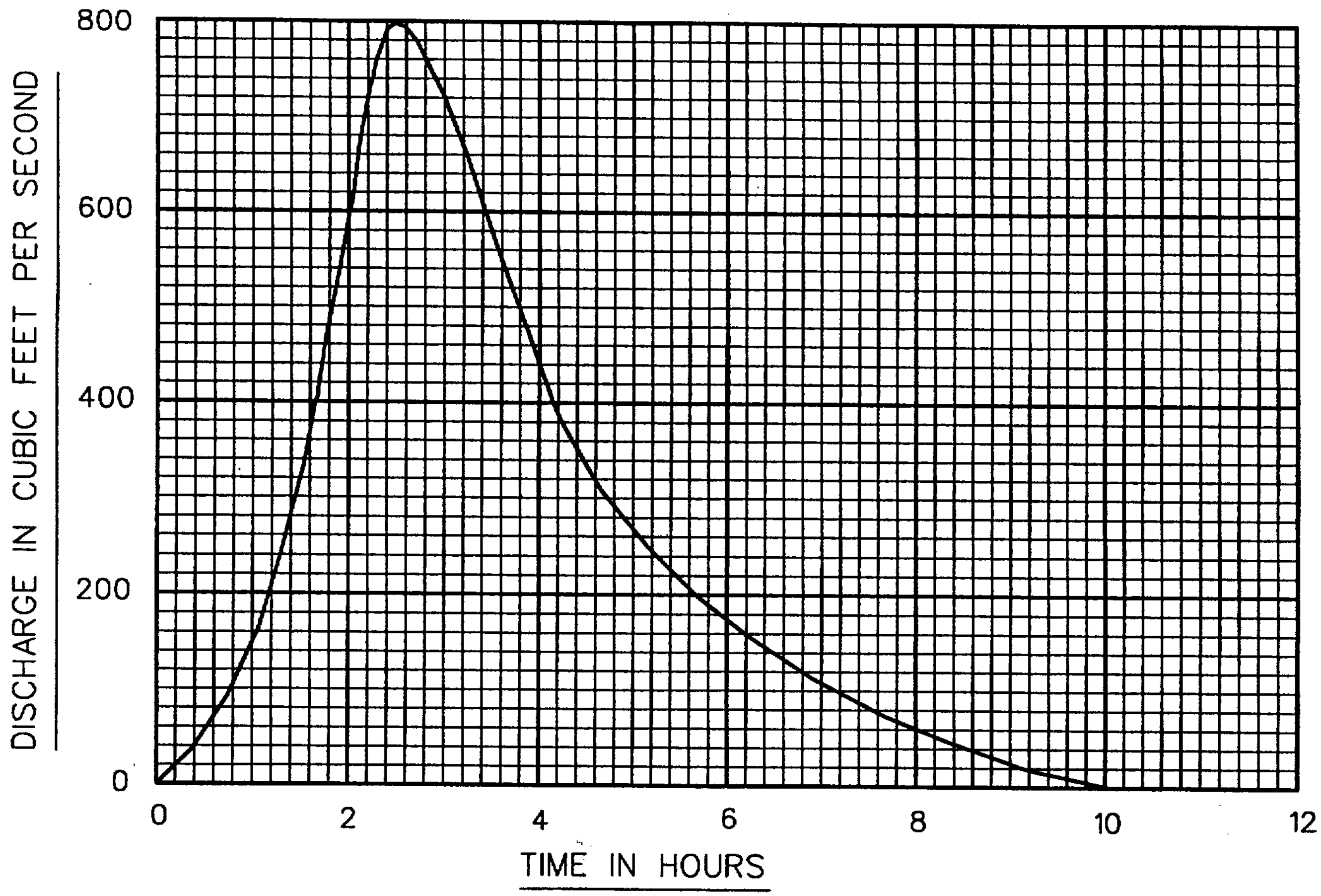

AVERAGE RECURRENCE INTERVAL IN YEARS
2
5
10
20
50
100
200
500
8,000
6,000
4,000
2,000
1,000
800
600
400
200
100
80
60
40
20
10
DISCHARGE IN CUBIC FEET PER SECOND
NOTES:
1. THE DRAINAGE AREA FOR THE DEER CREEK BASIN IS 25.1 SQUARE MILES.
2. SPECIFIC FREQUENCY DISCHARGES WERE COMPUTED USING THE HYDROLOGIC ENGINEERING CENTER'S FLOOD HYDROGRAPH PACKAGE. HEC-1.
3. SPECIFIC FREQUENCY POINT PRECIPITATION WAS TAKEN FROM THE NOAA ATLAS 2. PRECIPITATION-FREQUENCY ATLAS OF THE WESTERN UNITED STATES. VARYIABLE EXCESS RATES WERE APPLIED TO SPECIFIC FREQUENCY PRECIPITATION AS FOLLOWS:
RECURRENCE INTERVAL (YEARS)
EXCESS RATE IN PERCENT
2 5.4
5 9.4
10 12.8
25 17.1
50 21.6
100 26.5
200 32.2
500 40.9
4. THE FREQUENCY CURVE WAS COMPUTED BY FITTING A LOG PEARSON TYPE III CURVE THROUGH THE SPECIFIC FREQUENCY DISCHARGES FOR THE ABOVE RECURRENCE INTERVALS.
CURVE STATISTICS
MEAN LOGARITHM 2.0211
STANDARD DEVIATION 0.4426
COMPUTED SKEW 0.1678
SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
ANNUAL PEAK DISCHARGE FREQUENCY CURVE
U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH
DESIGNED HEITSTUMAN
DRAWN MAXSON
DATE MARCH 1999
A00613
99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2
EXCEEDANCE PROBABILITY IN PERCENT

CHART 1



UNIT HYDROGRAPH PARAMETERS

DA = 3.96 SQUARE MILES
L = 2.42 MILES
Lca = 1.35 MILES
Ct = 1.55
Tpr = 2.23
Qp = 798 cfs

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
WEST FORK DEER CREEK

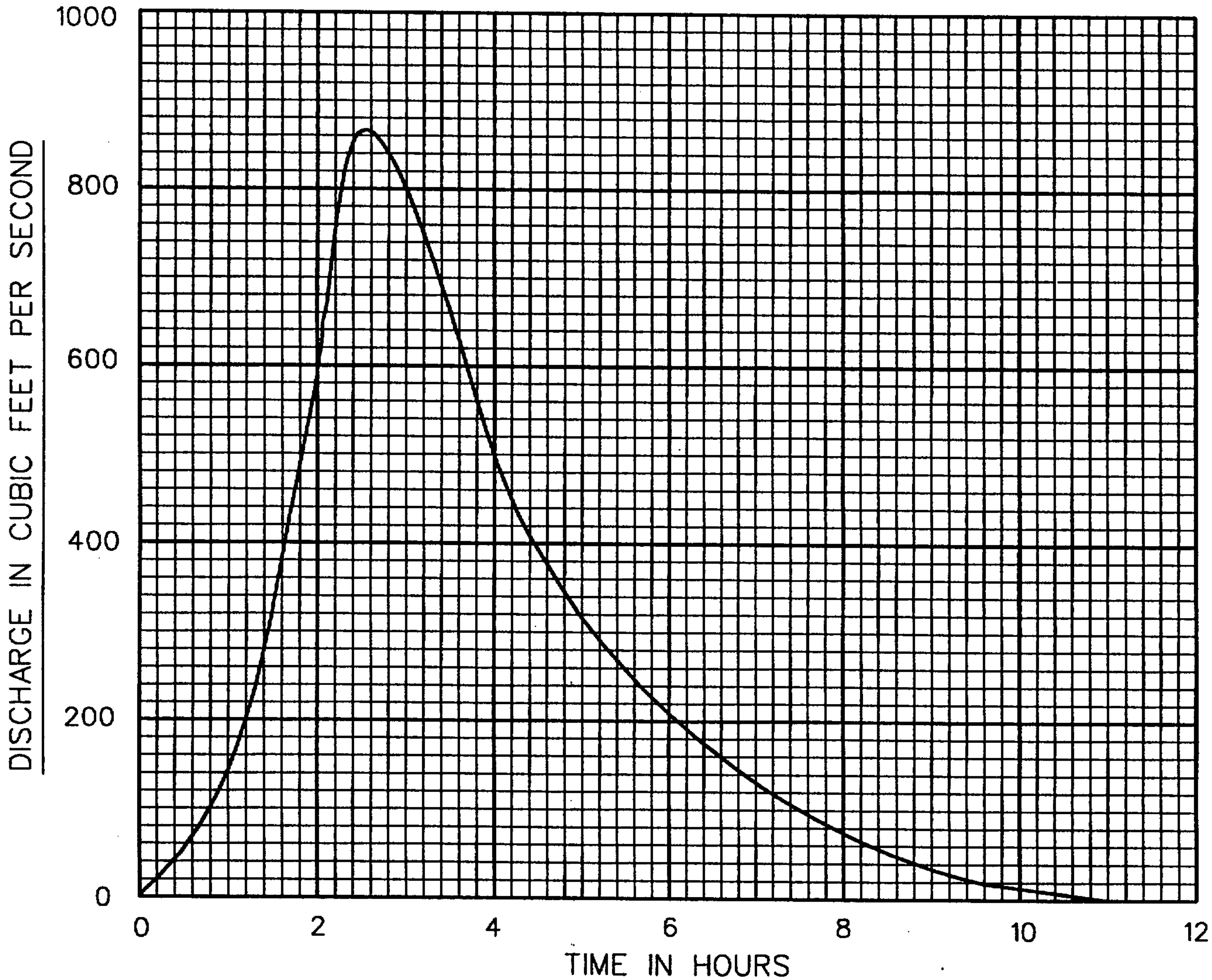
30 MINUTE UNIT HYDROGRAPH

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00599

CHART 2



UNIT HYDROGRAPH PARAMETERS

DA - 4.43 SQUARE MILES
L - 3.38 MILES
Lca - 1.57 MILES
Ct - 1.38
Tpr - 2.30
Qp - 866 CFS

DATE	REVISION	BY

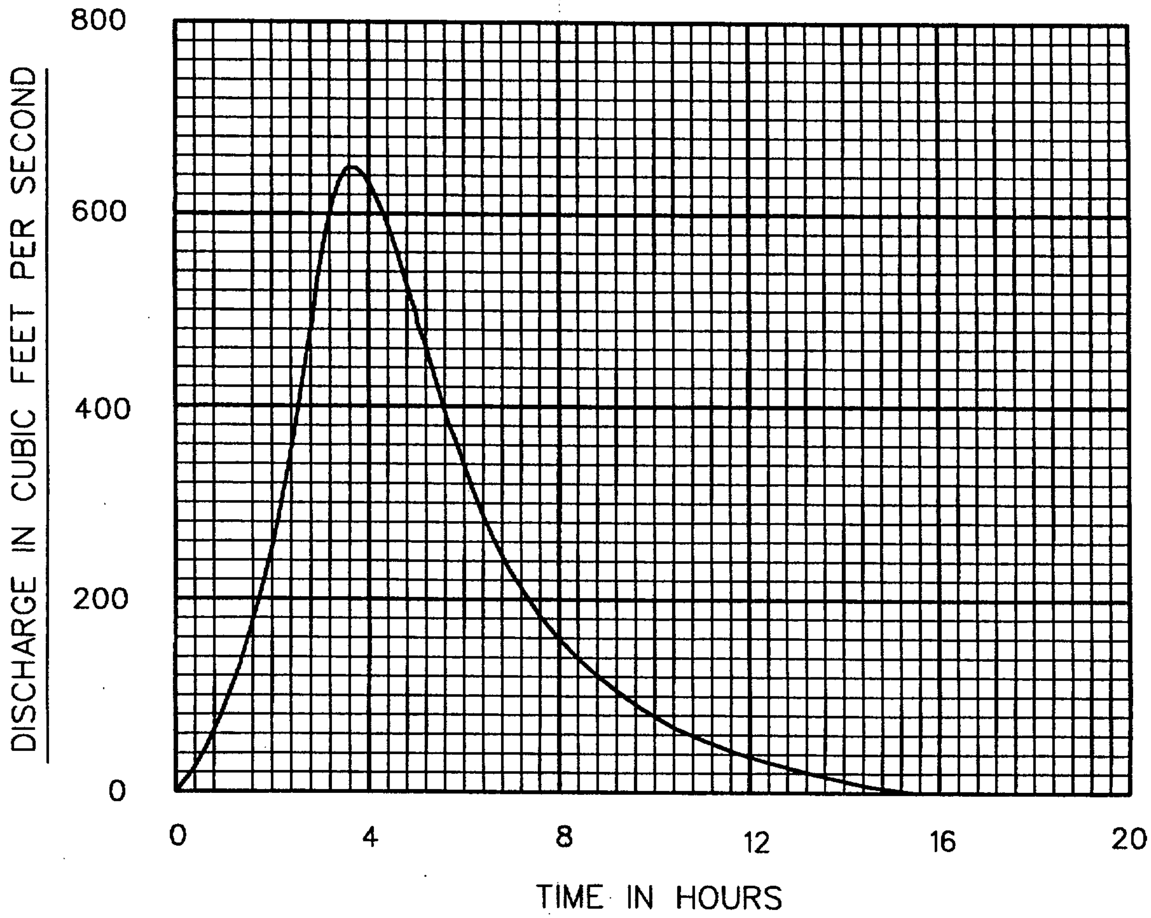
SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
LARABEE MEADOWS

30 MINUTE UNIT HYDROGRAPH

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00600



UNIT HYDROGRAPH PARAMETERS

DA = 4.77 SQUARE MILES
L = 3.45 MILES
Lca = 1.48 MILES
Ct = 2.05
Tpr = 3.31
Qp = 648 CFS

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
UPPER DEER CREEK

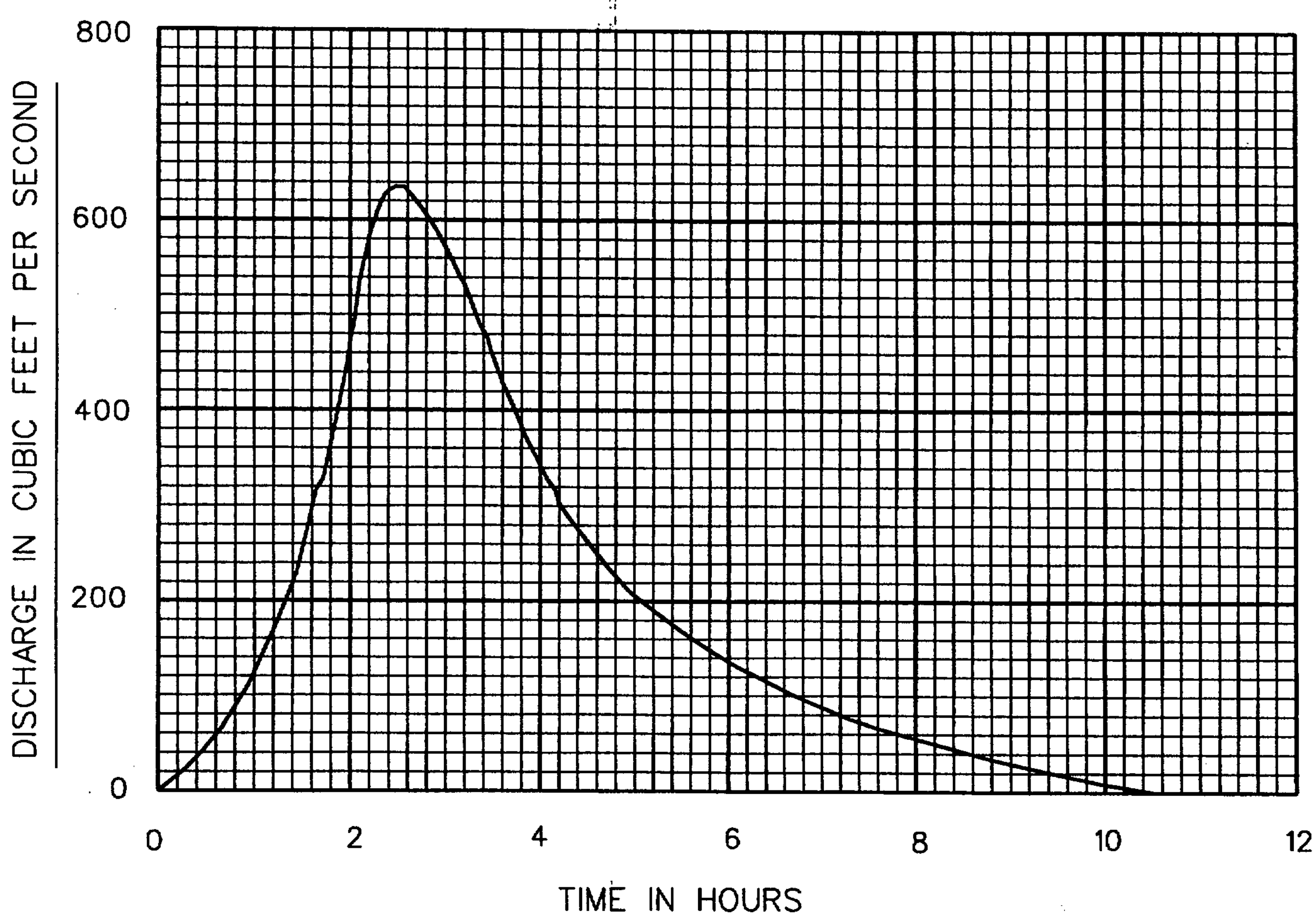
30 MINUTE UNIT HYDROGRAPH

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00601

CHART 4



UNIT HYDROGRAPH PARAMETERS

DA - 3.16 SQUARE MILES
L - 3.20 MILES
Lca - 1.74 MILES
Ct - 1.32
Tpr - 2.24
Qp - 636 CFS

DATE	REVISION	BY

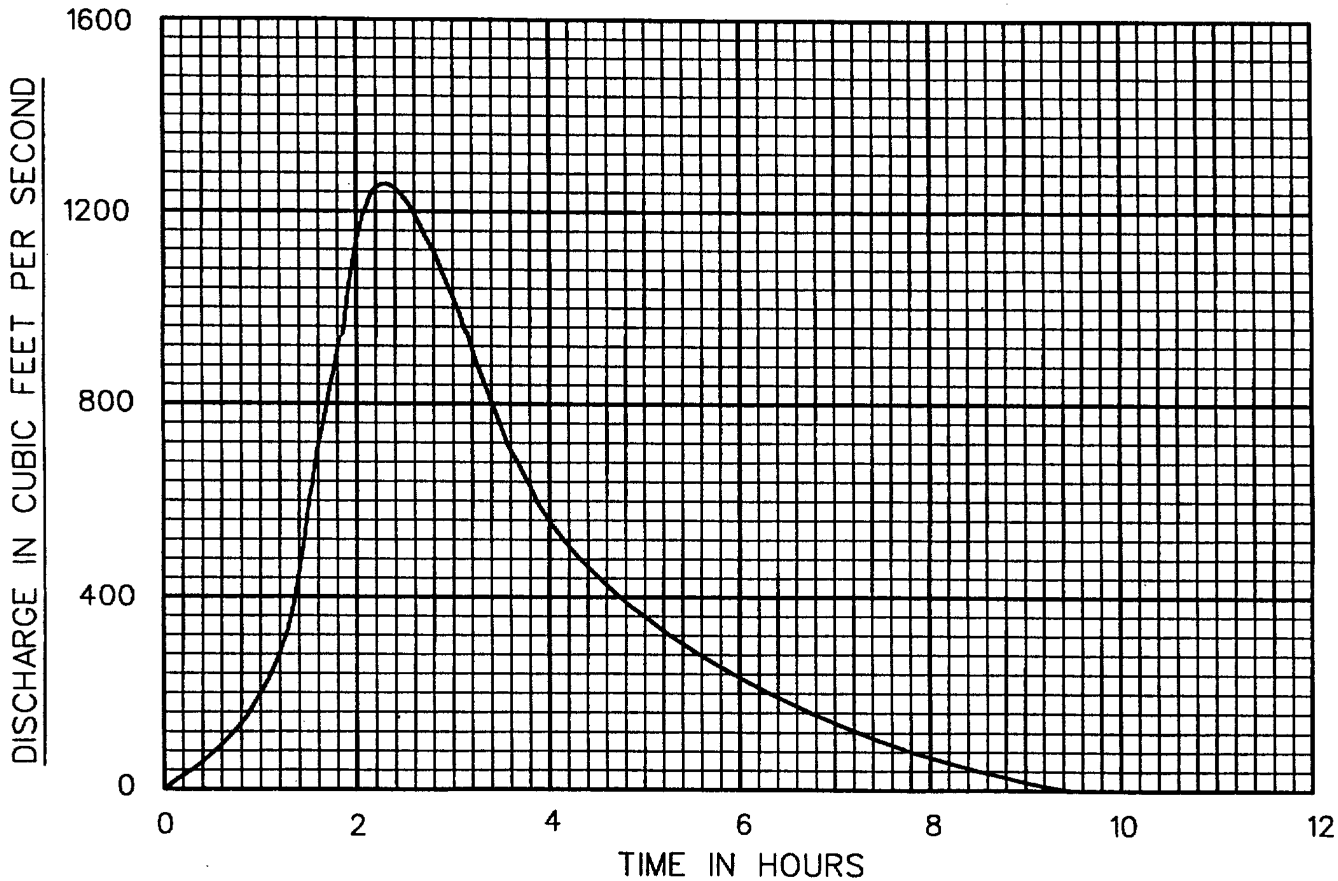
SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
SWAMP CREEK

30 MINUTE UNIT HYDROGRAPH

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00602



UNIT HYDROGRAPH PARAMETERS

DA - 5.71 SQUARE MILES
L - 4.22 MILES
Lca - 2.25 MILES
Ct - 1.02
Tpr - 2.04
Qp - 1260 CFS

A00603

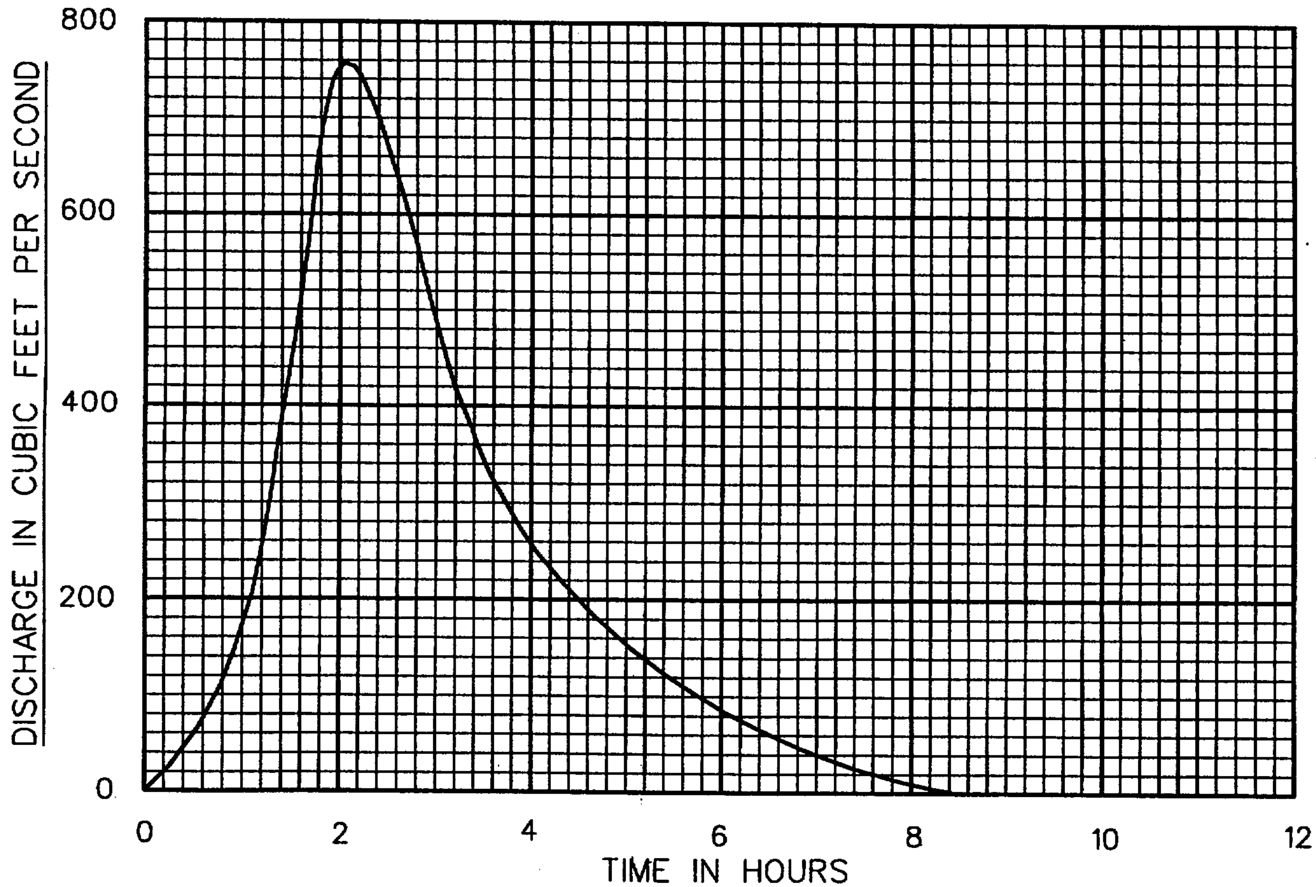
DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
LOWER DEER CREEK

30 MINUTE UNIT HYDROGRAPH

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999



UNIT HYDROGRAPH PARAMETERS

DA - 3.02 SQUARE MILES
L - 3.64 MILES
Lca - 0.85 MILES
Ct - 1.25
Tpr - 1.80
Qp - 757 CFS

A00604

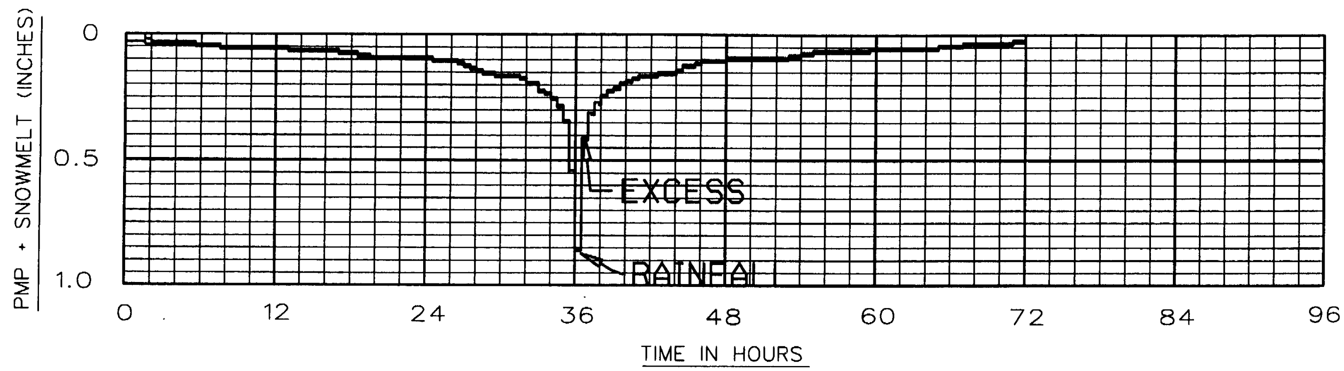
DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR
RAIL ROAD GRADE

30 MINUTE UNIT HYDROGRAPH

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

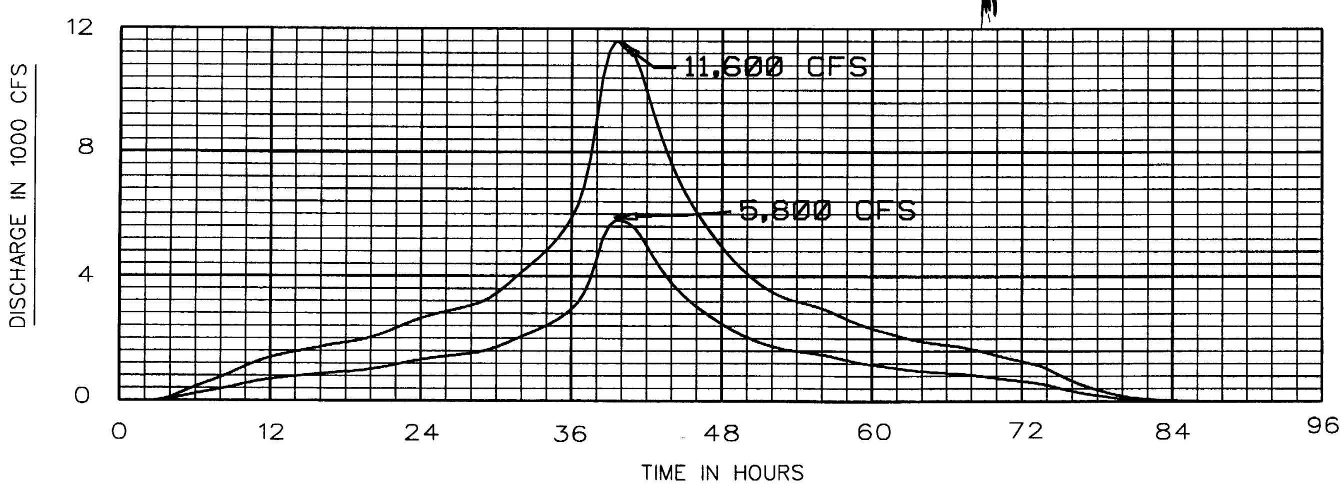
DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999



PROBABLE MAXIMUM PRECIPITATION AND SNOWMENT

PMP IN INCHES

PRECIP	8.5
SNOWMENT	7.55
LOSSES	1.16
EXCESS	14.89



PMF & ONE HALF PMF HYDROGRAPHS

FLOOD VOLUME

WATER = 19.950 ACRE-FEET
PEAK FLOW = 463 CFS/SQ. MI.

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

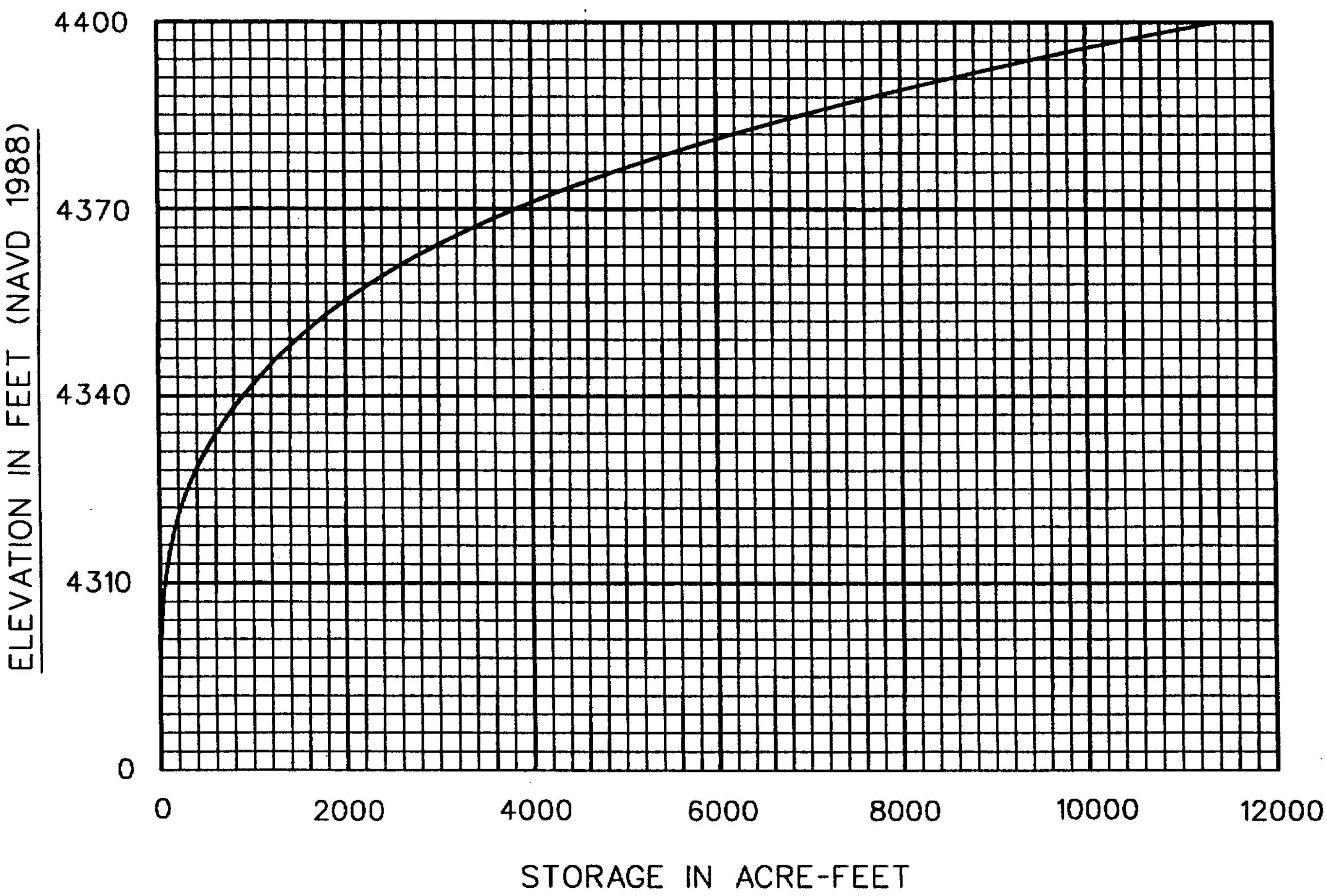
PROBABLE MAXIMUM FLOOD (PMF) AND ONE HALF PMF

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00605

CHART 8



DATE	REVISION	BY

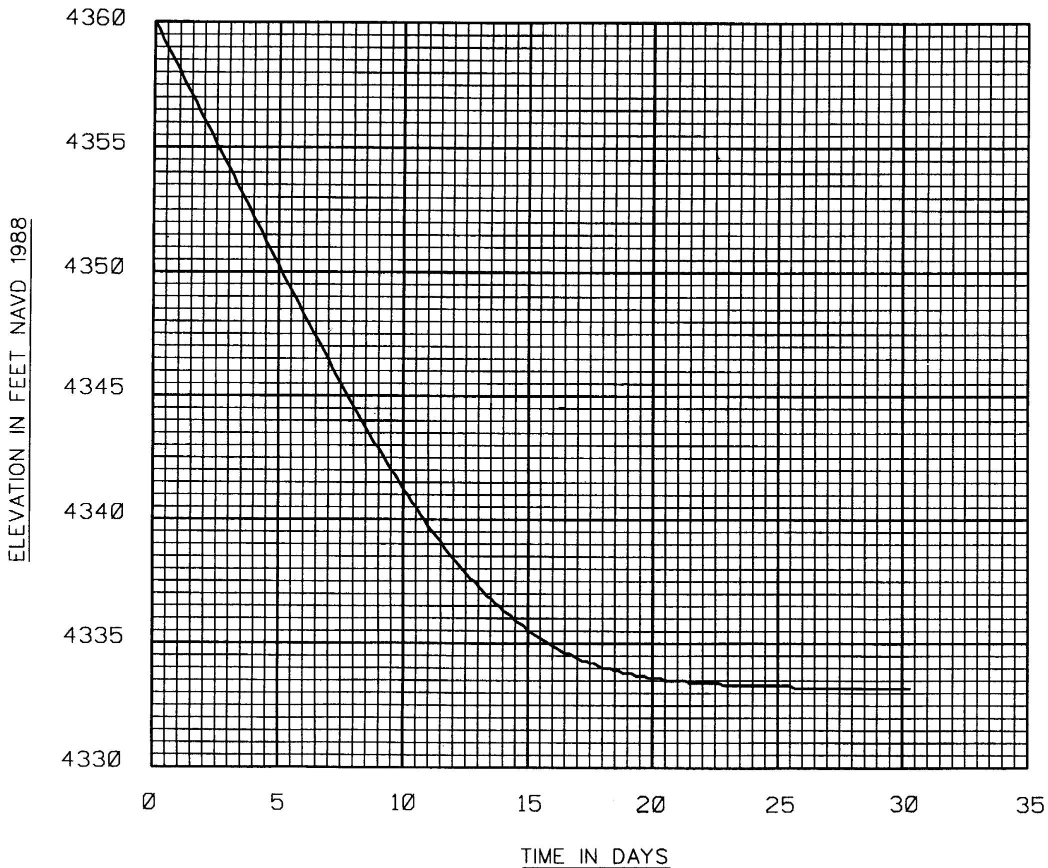
SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

STORAGE VS. ELEVATION CURVE

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00606



NOTES:

1. DEER CREEK RESERVOIR DRAWDOWN BEGAN WITH THE POOL AT THE SPILLWAY CREST, 4360.0 FEET NAVD 1988.

2. INFLOW TO THE RESERVOIR DURING THE DRAWDOWN WAS A CONSTANT 50 CFS WHICH IS THE AVERAGE FLOW FOR THE APRIL THROUGH JULY ER 1110-2-50 DATED 22 AUGUST 1975, "LOW LEVEL DISCHARGE FACILITIES FOR DRAWDOWN OF IMPOUNDMENTS," SPECIFIES THAT AN INFLOW EQUAL TO THE AVERAGE FLOW OF THE HIGHEST CONSECUTIVE FOUR-MONTH PERIOD SHOULD BE USED FOR DRAWDOWN ANALYSES.

3. NOTE THAT THE LOW LEVEL OUTLET CANNOT LOWER THE RESERVOIR BELOW ELEVATION 4333.2. AT THIS ELEVATION APPROXIMATELY 400 ACRE-FEET OF SEDIMENT AND 180 ACRE-FEET OF WATER REMAINS IN THE RESERVOIR FOR A TOTAL DEAD STORAGE OF 580 ACRE-FEET.

4. LOW LEVEL OUTLET RATING CURVE PROVIDED BY HYDRAULIC DESIGN SECTION, FEBRUARY 1999.

DATE	REVISION	BY

SALMON RIVER BASIN

DEER CREEK DAM AND RESERVOIR

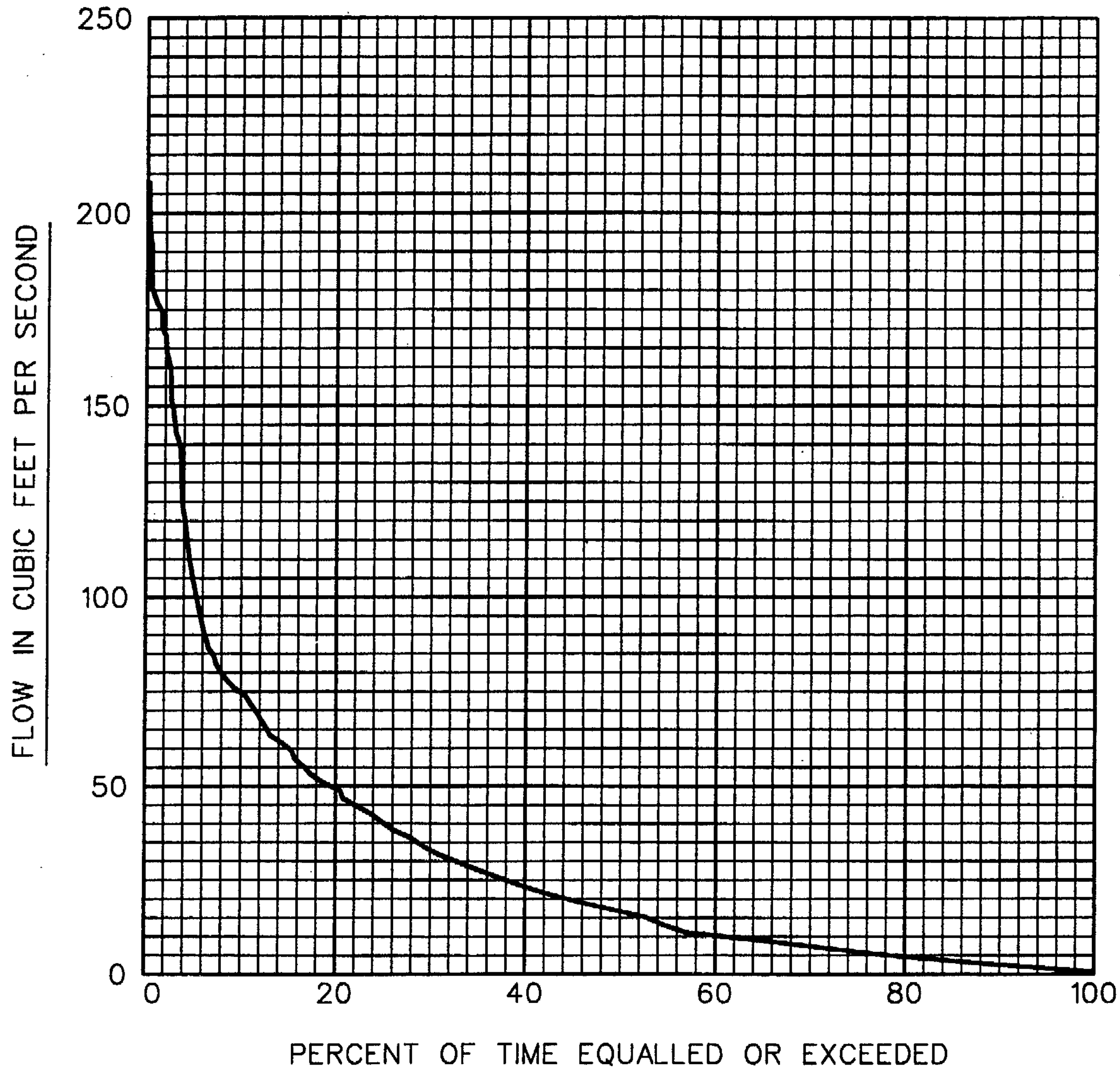
DRAWDOWN CURVE

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00607

CHART 10



NOTES:

1. THE CURVE IS BASED ON UNITED STATES GEOLOGICAL SURVEY GAGING STATION NUMBER 13317500, DEER CREEK NEAR WINCHESTER, IDAHO MEAN DAILY DISCHARGE DATA FOR 1 APRIL THROUGHT 31 JULY.

2. PERIOD OF RECORD FOR THIS CURVE IS: 1 OCTOBER 1951 THROUGH 30 NOVEMBER 1956.

3. THE PERIOD OF 1 APRIL THROUGH 31 JULY 1956 THE AVERAGE DAILY FLOW WAS APPROXIMATELY 44 CUBIC FEET PER SECOND.

4. THE CURVE REPRESENTS THE PERCENT OF TIME IN THE PERIOD OF RECORD THAT THE MEAN DAILY FLOW WAS EQUALLED OR EXCEEDED.

A00598

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK NEAR WINCHESTER, IDAHO

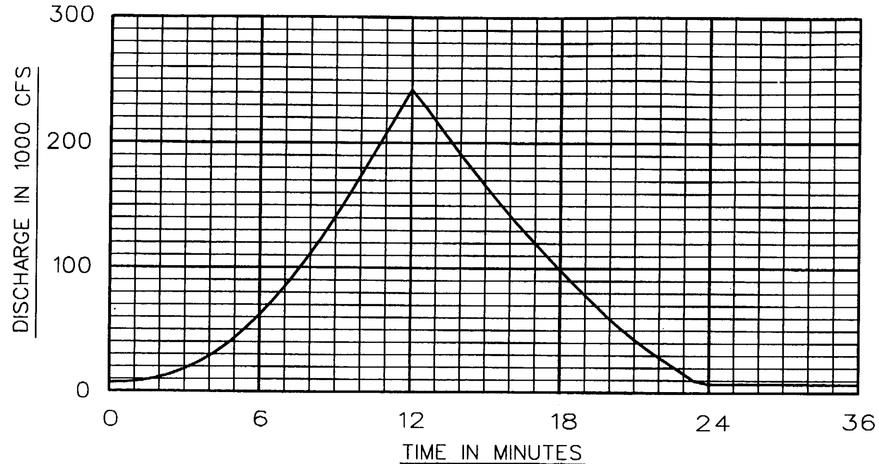
FLOW DURATION CURVE

APRIL THROUGH JULY

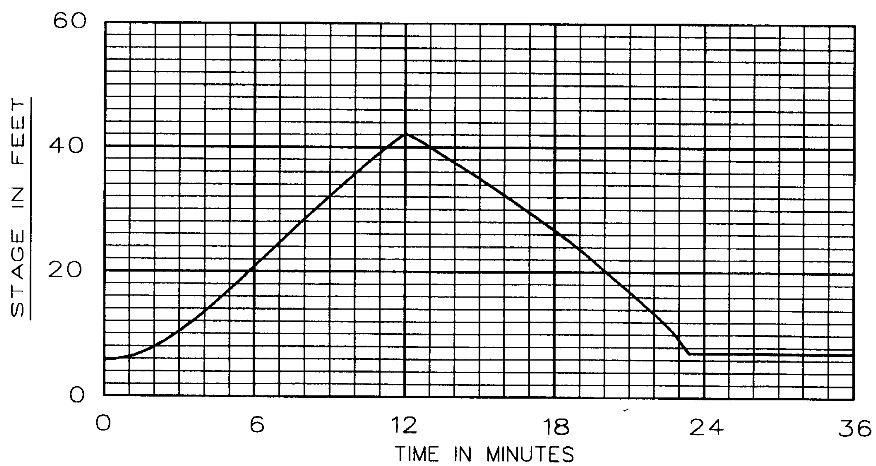
U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

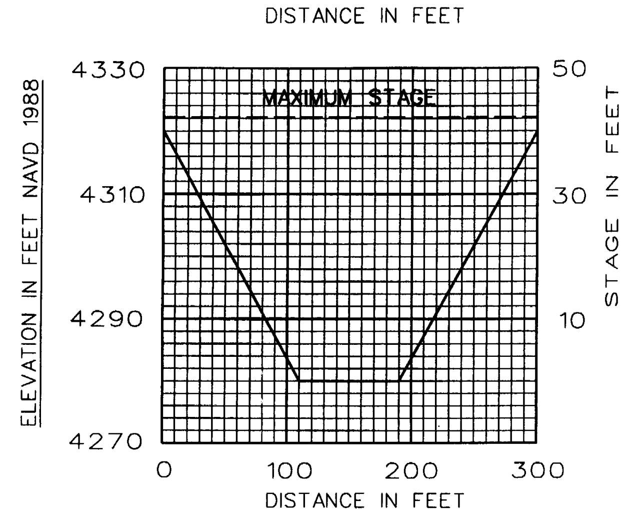
CHART 11



HYDROGRAPH



STAGE



CROSS SECTION 0.00

NOTES:

1. THE PEAK STAGE AT THIS CROSS SECTION IS 42.2 FEET.
2. THE PEAK DISCHARGE AT THIS CROSS SECTION IS 242,800 CFS

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

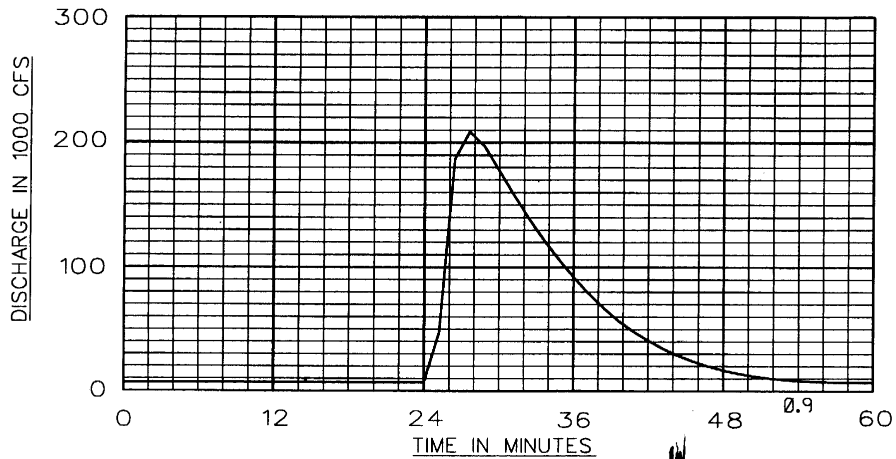
DAM BREAK ANALYSIS
CROSS SECTION AT DAM SITE
(CROSS SECTION 0.00)

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

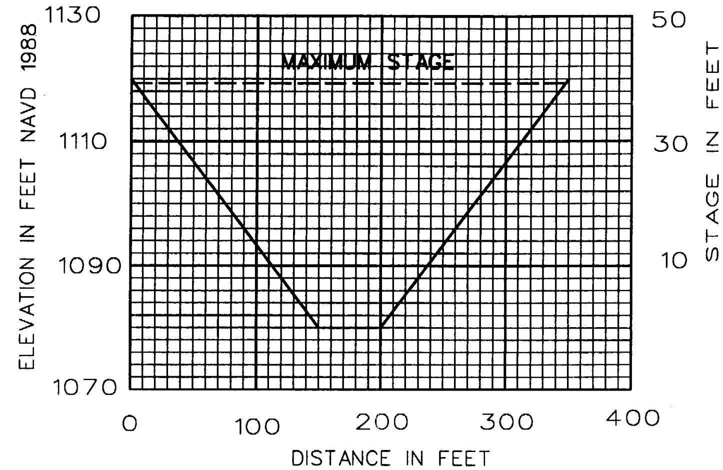
DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00608

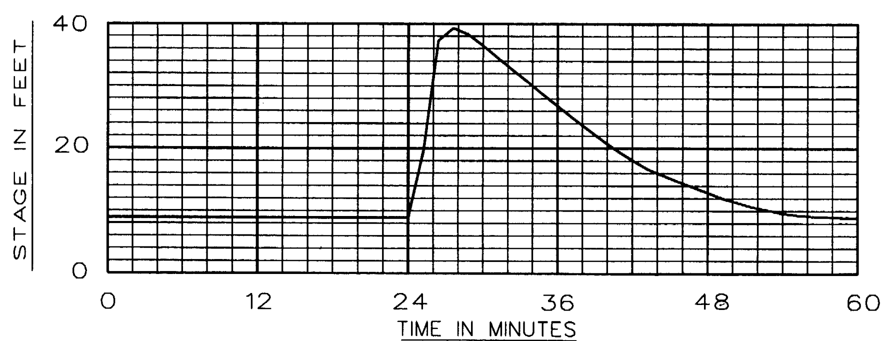
CHART 12



HYDROGRAPH



CROSS SECTION 6.72



STAGE

NOTES:

1. THE PEAK STAGE AT THIS CROSS SECTION IS 39.3 FEET
2. THE PEAK DISCHARGE AT THIS CROSS SECTION IS 208,800 CFS.

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

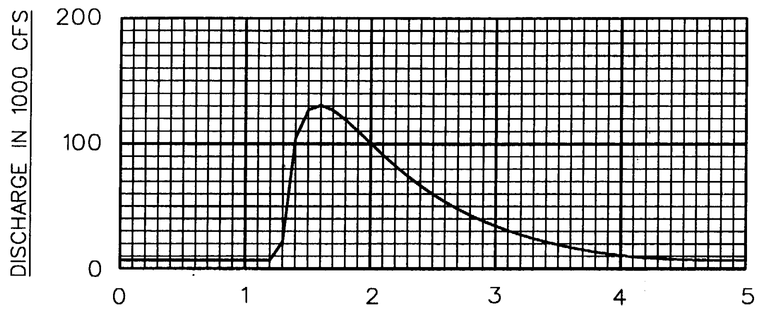
DAM BREAK ANALYSIS
CROSS SECTION AT MOUTH OF DEER CREEK
(CROSS SECTION 6.72)

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

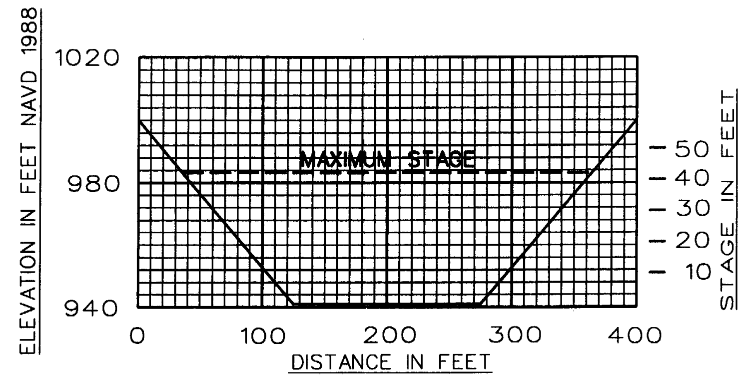
DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00609

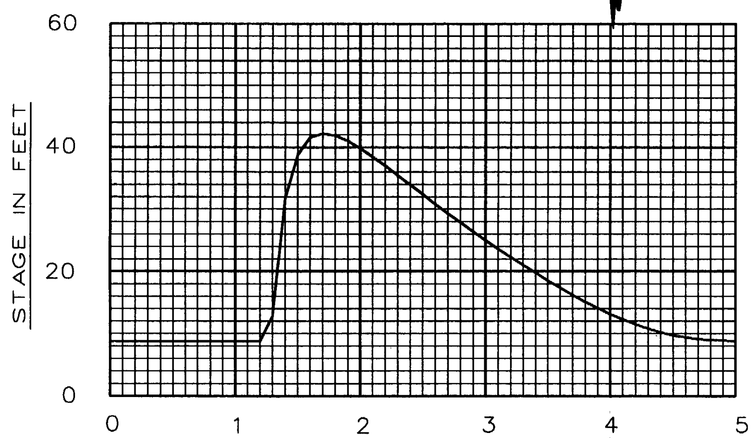
CHART 13



HYDROGRAPH



CROSS SECTION 19.72



STAGE

NOTES:

1. THE PEAK STAGE AT THIS CROSS SECTION IS 42.2.
2. THE PEAK DISCHRGE AT THIS CROSS SECTION IS 130,800

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

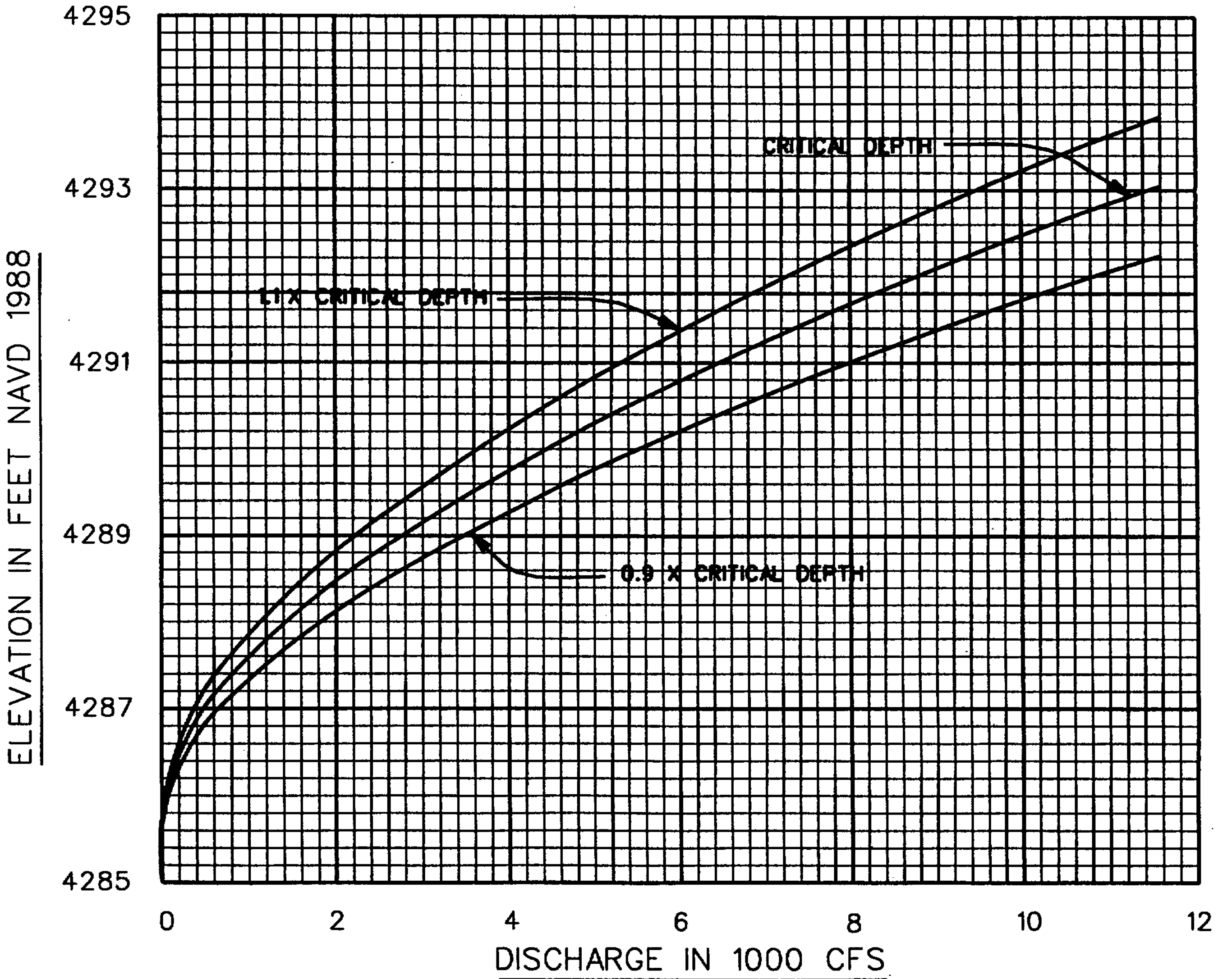
DAM BREAK ANALYSIS
CROSS SECTION AT MOUTH
OF SALMON RIVER
(CROSS SECTION 19.72)

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00610

CHART 14



NOTES:

1. THE CROSS SECTION IS LOCATED APPROXIMATELY 110 FEET DOWNSTREAM OF THE AXIS OF THE DEER CREEK DAM SITE.
2. THE RATING CURVES ARE BASED ON THE EXISTING CONDITION PRIOR TO ANY EXCAVATION OR OTHER MODIFICATIONS.
3. BACKWATER COMPUTATIONS COMPUTE CRITICAL DEPTH FOR THE ENTIRE RANGE OF FLOW.

DATE	REVISION	BY

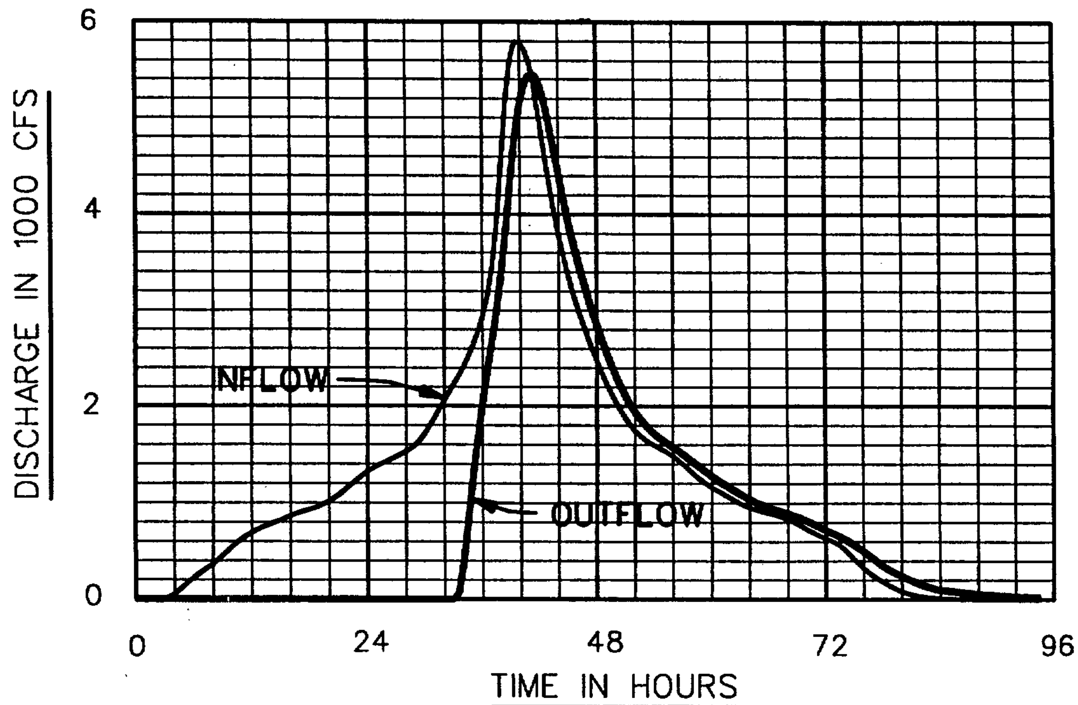
SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

TAILWATER RATING CURVE

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00611



NOTES:

1. THE SPILLWAY WIDTH FOR THE RCC DAM IS 100 FEET.

2. THE SPILLWAY RATING CURVE WAS PROVIDED BY THE HYDRAULIC DESIGN SECTION.

3. THE PEAK INFLOW IS APPROXIMATELY 5,800 CFS. THE PEAK OUTFLOW IS APPROXIMATELY 5,460 CFS.

4. AT THE BEGINNING OF THE STORM THE RESERVOIR IS ASSUMED TO BE EMPTY.

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

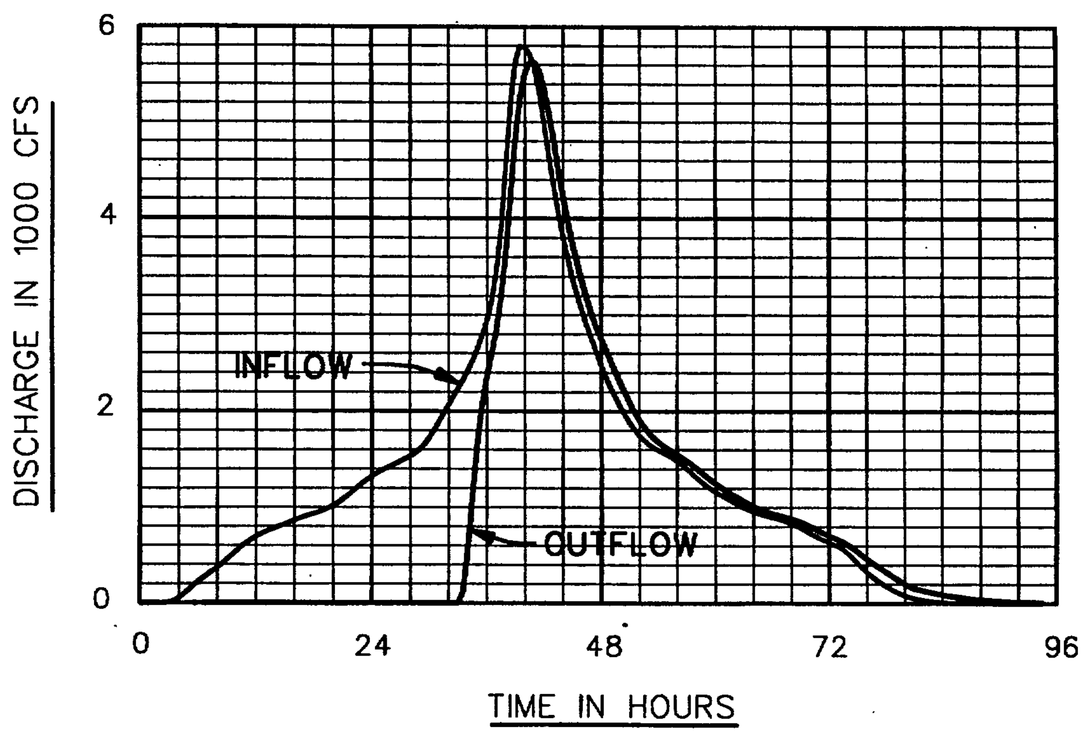
RCC DAM

ONE-HALF PROBABLE MAXIMUM FLOOD INFLOW AND OUTFLOW HYDROGRAPHS

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00617



NOTES:

1. THE SPILLWAY WIDTH FOR THE EMBANKMENT DAM IS 150 FEET.

2. THE SPILLWAY RATING CURVE WAS PROVIDED BY THE HYDRAULIC DESIGN SECTION.

3. THE PEAK INFLOW IS APPROXIMATELY 5,800 CFS. THE PEAK OUTFLOW IS APPROXIMATELY 5,630 CFS.

4. AT THE BEGINNING OF THE STORM THE RESERVOIR IS ASSUMED TO BE EMPTY.

DATE	REVISION	BY

SALMON RIVER BASIN
DEER CREEK DAM AND RESERVOIR

EMBANKMENT DAM

ONE-HALF PROBABLE MAXIMUM FLOOD INFLOW AND OUTFLOW HYDROGRAPHS

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA - HYDROLOGY BRANCH

DESIGNED	DRAWN	DATE
HEITSTUMAN	MAXSON	MARCH 1999

A00612

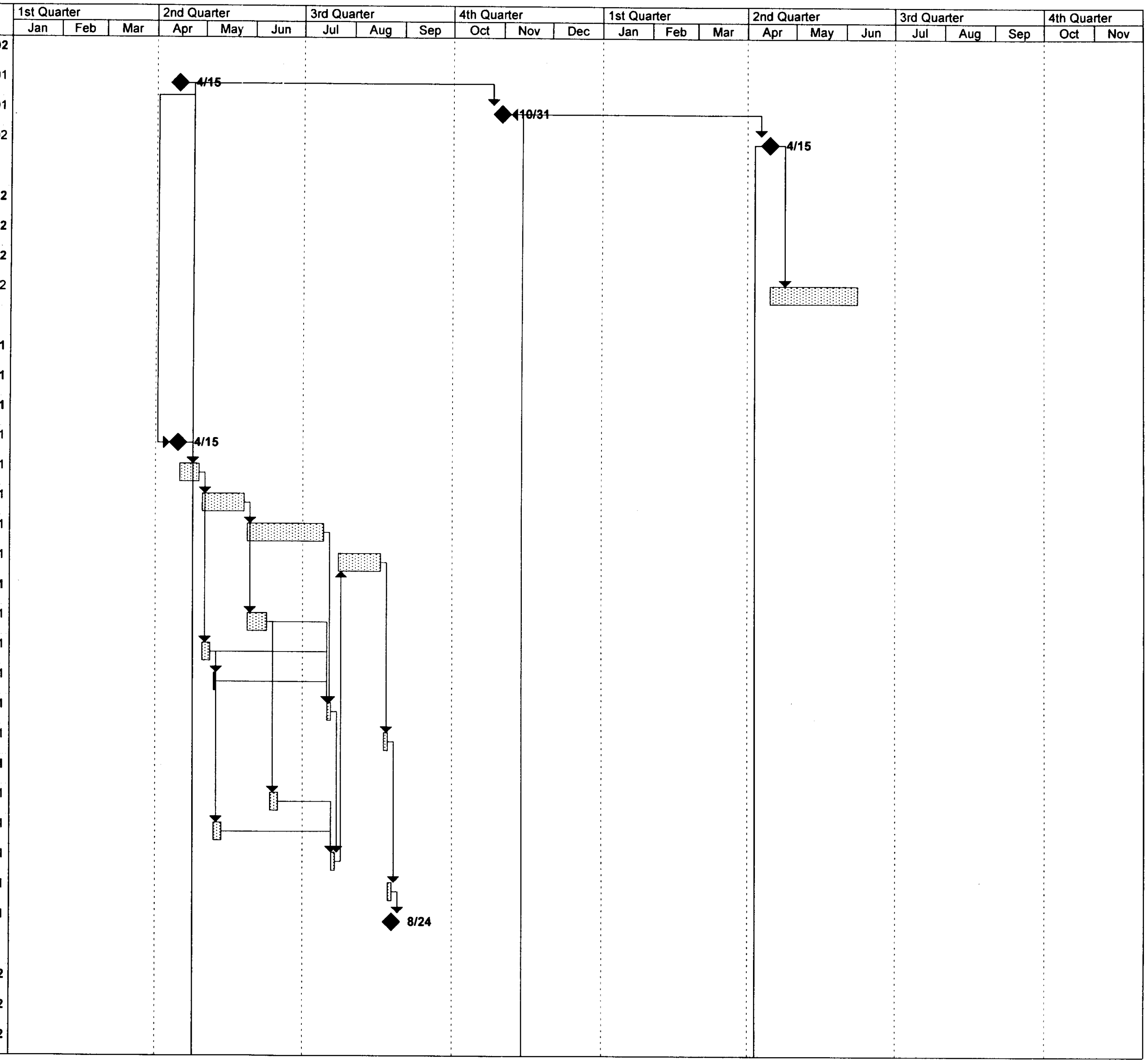
APPENDIX E

Construction Schedule

1. Construction Schedule for Embankment Dam Project
2. Construction Schedule for RCC Dam Project

Construction Schedule for Embankment Dam Project

ID	Task Name	Duration	Start	Finish
1	**Time Restrictions**	**52 wks**	**4/15/01**	**4/15/02**
2	Project Construction Start	0 wks	4/15/01	4/15/01
3	First Winter Shut Down	0 wks	10/31/01	10/31/01
4	Second Season Start	0 wks	4/15/02	4/15/02
5				
6	**RESERVOIRS**	**8 wks**	**4/15/02**	**6/7/02**
7	**CLEARING AND DEBRIS REMOVAL**	**8 wks**	**4/15/02**	**6/7/02**
8	**Clear, Grubb,Hvy Brush&Lgh Trees**	**8 wks**	**4/15/02**	**6/7/02**
9	Clr,H-Brush W/Avg Grub,M/H-Trees	8 wks	4/15/02	6/7/02
10				
11	**ACCESS ROADS**	**19 wks**	**4/15/01**	**8/24/01**
12	**ROADS**	**19 wks**	**4/15/01**	**8/24/01**
13	**FOREST ROAD, IMPROVE EXISTING (A)**	**, 18 wks**	**4/15/01**	**8/17/01**
14	START WORK	0 wks	4/15/01	4/15/01
15	FOREST ROAD, PREP FOR SURFACING	2 wks	4/16/01	4/27/01
16	FOREST ROAD,CRUSHD SURFACING MAT	4 wks	4/30/01	5/25/01
17	FOREST ROAD, 4" BASE COURSE	7 wks	5/28/01	7/13/01
18	FOREST ROAD, 2" TOP COURSE	4 wks	7/23/01	8/17/01
19	**NEW PERM SITE ACCESS ROADS (B)**	**16.5 wks**	**4/30/01**	**8/22/01**
20	ACCESS ROAD,CRUSHD SURFACING MAT	2 wks	5/28/01	6/8/01
21	ACCESS ROAD, PREP FOR SURFACING	1 wk	4/30/01	5/4/01
22	ACCESS ROAD,CULVERTS-18"(5 EACH)	0.2 wks	5/7/01	5/7/01
23	ACCESS ROAD, 4" BASE COURSE	0.5 wks	7/16/01	7/18/01
24	ACCESS ROAD, 2" TOP COURSE	0.5 wks	8/20/01	8/22/01
25	**NEW PERM-TO-TOP OF DAM A-ROAD (C)**	**16 wks**	**5/7/01**	**8/24/01**
26	ACCESS ROAD,CRUSHD SURFACING MAT	1 wk	6/11/01	6/15/01
27	ACCESS ROAD, PREP FOR SURFACING	1 wk	5/7/01	5/11/01
28	ACCESS ROAD, 4" BASE COURSE	0.5 wks	7/18/01	7/20/01
29	ACCESS ROAD, 2" TOP COURSE	0.5 wks	8/22/01	8/24/01
30	FINISH WORK	0 wks	8/24/01	8/24/01
31				
32	**DAMS (COMPACTED EARTH FILL)**	**82.7 wks**	**4/16/01**	**11/14/02**
33	**SITE PREP**	**82.7 wks**	**4/16/01**	**11/14/02**
34	**MOB., DEMOB., AND PREWORK**	**82.7 wks**	**4/16/01**	**11/14/02**

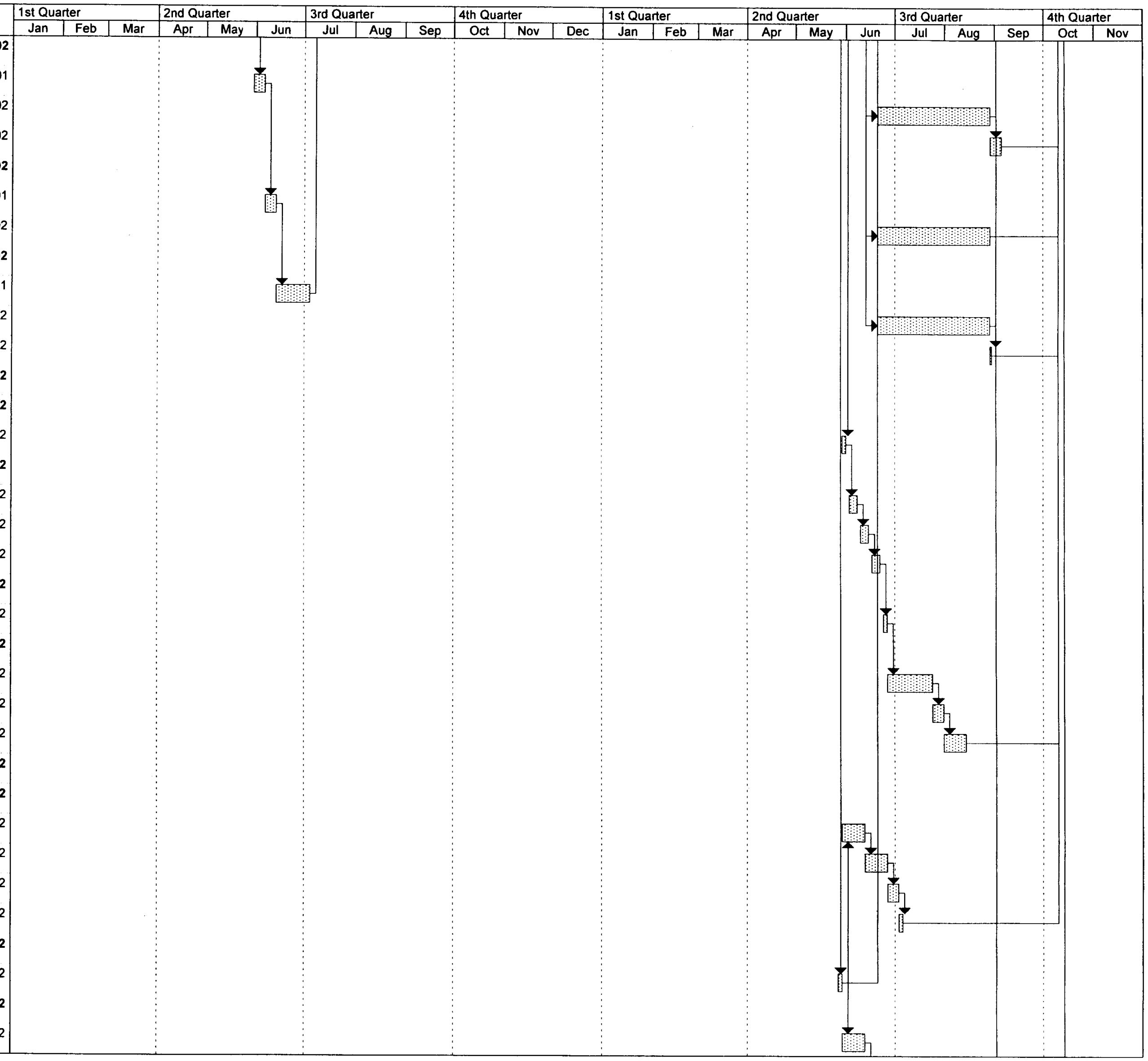


Construction Schedule for Embankment Dam Project

ID	Task Name	Duration	Start	Finish
35	Mob the first Season	4 wks	4/16/01	5/11/01
36	Demob the first Season	3 wks	7/4/01	7/25/01
37	Mob the Second Season	4 wks	4/15/02	5/10/02
38	Demob the Second Season	3 wks	10/24/02	11/14/02
39	**STORAGE &PONDING OF CONSTR WATER**	**22.7 wks**	**5/13/02**	**10/17/02**
40	Diversion Conduit Upper Dike	1 wk	5/13/02	5/17/02
41	Remove Diversion Upper Dike	1 wk	10/10/02	10/17/02
42	**DIVERSION AND CARE OF WATER**	**22.7 wks**	**5/20/02**	**10/24/02**
43	Diversion Conduit 48" Dia CMP	1 wk	5/20/02	5/24/02
44	Remove Diversion Upper Dike	1 wk	10/17/02	10/24/02
45	**SITE ACCESS & HAUL ROADS**	**0.5 wks**	**5/27/02**	**5/29/02**
46	Constr Road Grade Road Bed	0.5 wks	5/27/02	5/29/02
47	**FOUNDATION WORK**	**3.2 wks**	**5/29/02**	**6/20/02**
48	**EXCAVATION,UNCLASF**	**0.5 wks**	**5/29/02**	**5/31/02**
49	Excavation and Strip Foundation	0.5 wks	5/29/02	5/31/02
50	**EXPLORATORY DRILLING**	**0.5 wks**	**6/3/02**	**6/5/02**
51	Nx Exploratory Drilling	0.5 wks	6/3/02	6/5/02
52	**PRESURE TESTING NX HOLE**	**0.2 wks**	**6/5/02**	**6/6/02**
53	Presure Testing NX Hole	0.2 wks	6/5/02	6/6/02
54	**FOUNDATION CLEANUP**	**0.5 wks**	**6/6/02**	**6/10/02**
55	Foundation Cleanup	0.5 wks	6/6/02	6/10/02
56	**FOUND.TREAT.DRILL GROUT CURTAIN**	**1 wk**	**6/11/02**	**6/17/02**
57	Drill Foundation Grout Curtain	1 wk	6/11/02	6/17/02
58	**DENTAL CONCRETE**	**0.5 wks**	**6/18/02**	**6/20/02**
59	Dental Concrete	0.5 wks	6/18/02	6/20/02
60	**COMPACTED EARTH DAM**	**68.7 wks**	**5/14/01**	**9/5/02**
61	**IMPERVIOUS CORE MATERIAL (CH)**	**10 wks**	**6/20/02**	**8/29/02**
62	Load, Haul, Place Impervious Mat	10 wks	6/20/02	8/29/02
63	**SAND FILTER, (10' THICK)**	**65.7 wks**	**5/14/01**	**8/15/02**
64	Crushing & Stockpile Materials	2 wks	5/14/01	5/25/01
65	Load, Haul & Place Sand Filter	8 wks	6/20/02	8/15/02
66	**COBBLE BEDDING,(9" THICK GRAVEL)**	**65.7 wks**	**5/28/01**	**8/29/02**
67	Crushing & Stockpile Materials	0.5 wks	5/28/01	5/30/01
68	Load, Haul & Place Gravel Filter	10 wks	6/20/02	8/29/02

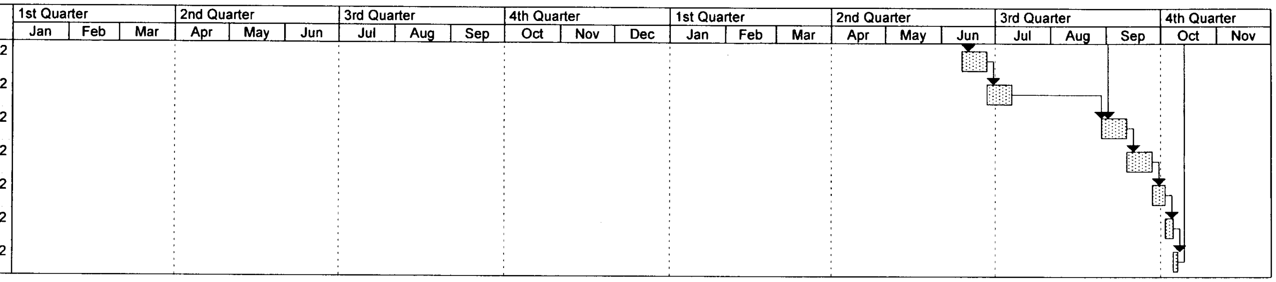
Construction Schedule for Embankment Dam Project

ID	Task Name	Duration	Start	Finish
69	**COBBLE 18"THICK SLOPE PROTECTION**	**66.2 wks**	**5/30/01**	**9/5/02**
70	Crushing & Stockpile Materials	1 wk	5/30/01	6/6/01
71	Load,Haul & Dumping Cobble Rocks	10 wks	6/20/02	8/29/02
72	Placing and Keying in Cobbles	1 wk	8/29/02	9/5/02
73	**RIPRAP BEDDING,(12"THICK GRAVEL)**	**64.2 wks**	**6/6/01**	**8/29/02**
74	Crushing & Stockpile Materials	1 wk	6/6/01	6/13/01
75	Load,Haul & Place Riprap Bedding	10 wks	6/20/02	8/29/02
76	**RIPRAP 30"THICK SLOPE PROTECTION**	**63.4 wks**	**6/13/01**	**8/30/02**
77	Crushing & Stockpile Materials	3 wks	6/13/01	7/4/01
78	Load, Haul & Dumping Riprap	10 wks	6/20/02	8/29/02
79	Placing and Keying in Riprap	0.2 wks	8/29/02	8/30/02
80	**SPILLWAY**	**11 wks**	**5/29/02**	**8/14/02**
81	**EXCAVATION,UNCLASF**	**,0.5 wks**	**5/29/02**	**5/31/02**
82	Excavation and Strip Foundation	0.5 wks	5/29/02	5/31/02
83	**EXCAVATION,ROCK EXCAVATION**	**3 wks**	**6/3/02**	**6/21/02**
84	Rock, Drill, Shot & Producing	1 wk	6/3/02	6/7/02
85	Presplit Rock, Drill, & Shot	1 wk	6/10/02	6/14/02
86	Load & Haul Ripped &Blasted Rock	1 wk	6/17/02	6/21/02
87	**FOUNDATION CLEANUP**	**0.5 wks**	**6/24/02**	**6/26/02**
88	Foundation Cleanup	0.5 wks	6/24/02	6/26/02
89	**CONCRETE OVERFLOW SECTION**	**7 wks**	**6/26/02**	**8/14/02**
90	Concrete Overflow Section	4 wks	6/26/02	7/24/02
91	Concrete Retaining Walls' Slabs	1 wk	7/24/02	7/31/02
92	Concrete Retaining Walls	2 wks	7/31/02	8/14/02
93	**OUTLET WORKS**	**19.7 wks**	**5/27/02**	**10/10/02**
94	**CONCRETE OUTLET&IMPACT BASIN STR**	**5.5 wks**	**5/29/02**	**7/5/02**
95	Concr.Impact Basin Slab	2 wks	5/29/02	6/12/02
96	Concr.Impact Basin Wall & Baffle	2 wks	6/12/02	6/26/02
97	Concr.Impact Basin Precast Slab	1 wk	6/26/02	7/3/02
98	Outlet Channel Rip Rap,20" Thick	0.5 wks	7/3/02	7/5/02
99	**OUTLET CONDUIT (48" DIA. PIPE)**	**0.5 wks**	**5/27/02**	**5/29/02**
100	Outlet Conduit (48" Dia. Pipe)	0.5 wks	5/27/02	5/29/02
101	**INTAKE STRUCTURE**	**19.2 wks**	**5/29/02**	**10/10/02**
102	Intake Tower Foundation Slab	2 wks	5/29/02	6/12/02



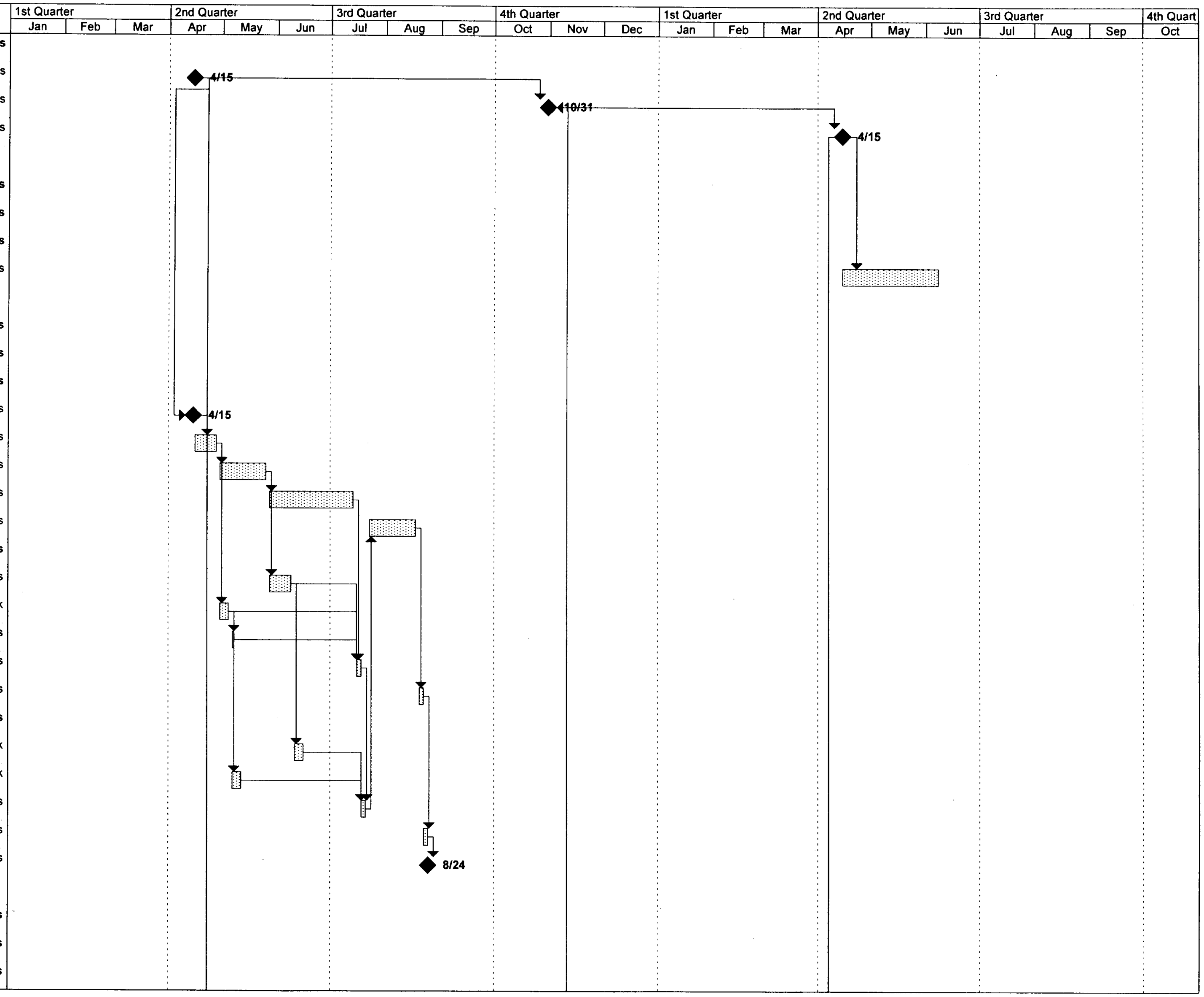
Construction Schedule for Embankment Dam Project

ID	Task Name	Duration	Start	Finish
103	Intake Tower Walls	2 wks	6/12/02	6/26/02
104	Intake Tower Elevated Slab	2 wks	6/26/02	7/10/02
105	Intake Gate Controller Slab	2 wks	8/29/02	9/12/02
106	Intake Tower Control Room	2 wks	9/12/02	9/26/02
107	Intake Tower Trashracks	1 wk	9/26/02	10/3/02
108	24"x 24" Slide Gate & Controller	0.5 wks	10/3/02	10/7/02
109	12" Dia. Vent Pipe	0.5 wks	10/8/02	10/10/02



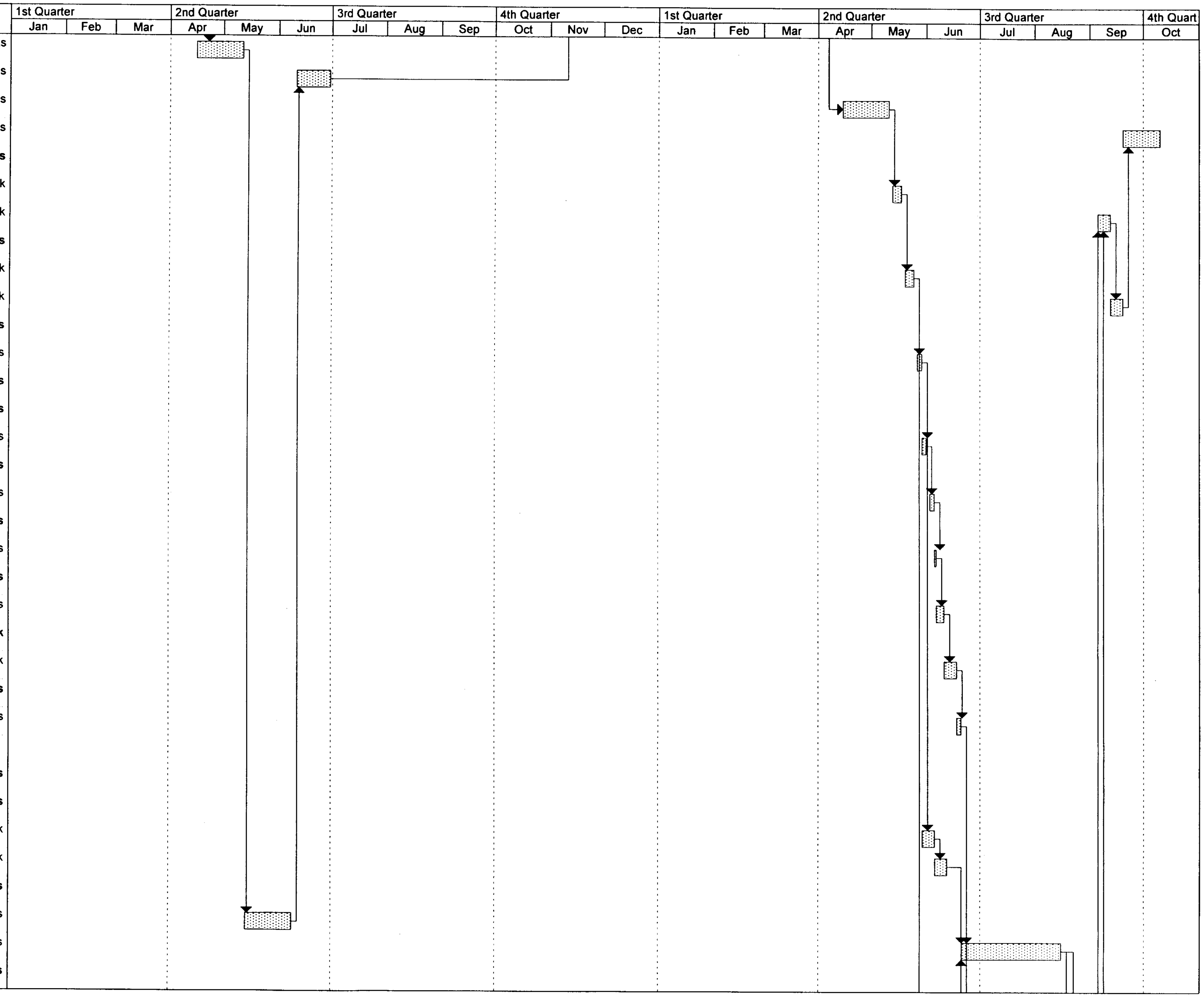
Construction Schedule for RCC Dam Project

ID	Task Name	Duration
1	**Time Restrictions**	**52 wks**
2	Project Construction Start	0 wks
3	First Winter Shut Down	0 wks
4	Second Season Start	0 wks
5		
6	**RESERVOIRS**	**8 wks**
7	**CLEARING AND DEBRIS REMOVAL**	**8 wks**
8	**Clear, Grubb,Hvy Brush&Lgh Trees**	**8 wks**
9	Clr,H-Brush W/Avg Grub,M/H-Trees	8 wks
10		
11	**ACCESS ROADS**	**19 wks**
12	**ROADS**	**19 wks**
13	**FOREST ROAD, IMPROVE EXISTING(A)**	**18 wks**
14	START WORK	0 wks
15	FOREST ROAD, PREP FOR SURFACING	2 wks
16	FOREST ROAD,CRUSHD SURFACING MAT	4 wks
17	FOREST ROAD, 4" BASE COURSE	7 wks
18	FOREST ROAD, 2" TOP COURSE	4 wks
19	**NEW PERM SITE ACCESS ROADS (B)**	**16.5 wks**
20	ACCESS ROAD,CRUSHD SURFACING MAT	2 wks
21	ACCESS ROAD, PREP FOR SURFACING	1 wk
22	ACCESS ROAD,CULVERTS-18"(5 EACH)	0.2 wks
23	ACCESS ROAD, 4" BASE COURSE	0.5 wks
24	ACCESS ROAD, 2" TOP COURSE	0.5 wks
25	**NEW PREM-TO-TOP OF DAM A-ROAD(C)**	**16 wks**
26	ACCESS ROAD,CRUSHD SURFACING MAT	1 wk
27	ACCESS ROAD, PREP FOR SURFACING	1 wk
28	ACCESS ROAD, 4" BASE COURSE	0.5 wks
29	ACCESS ROAD, 2" TOP COURSE	0.5 wks
30	FINISH WORK	0 wks
31		
32	**ROLLER COMPACTED CONCRETE DAM**	**77.7 wks**
33	**SITE PREP**	**77.7 wks**
34	**MOB., DEMOB., AND PREWORK**	**77.7 wks**



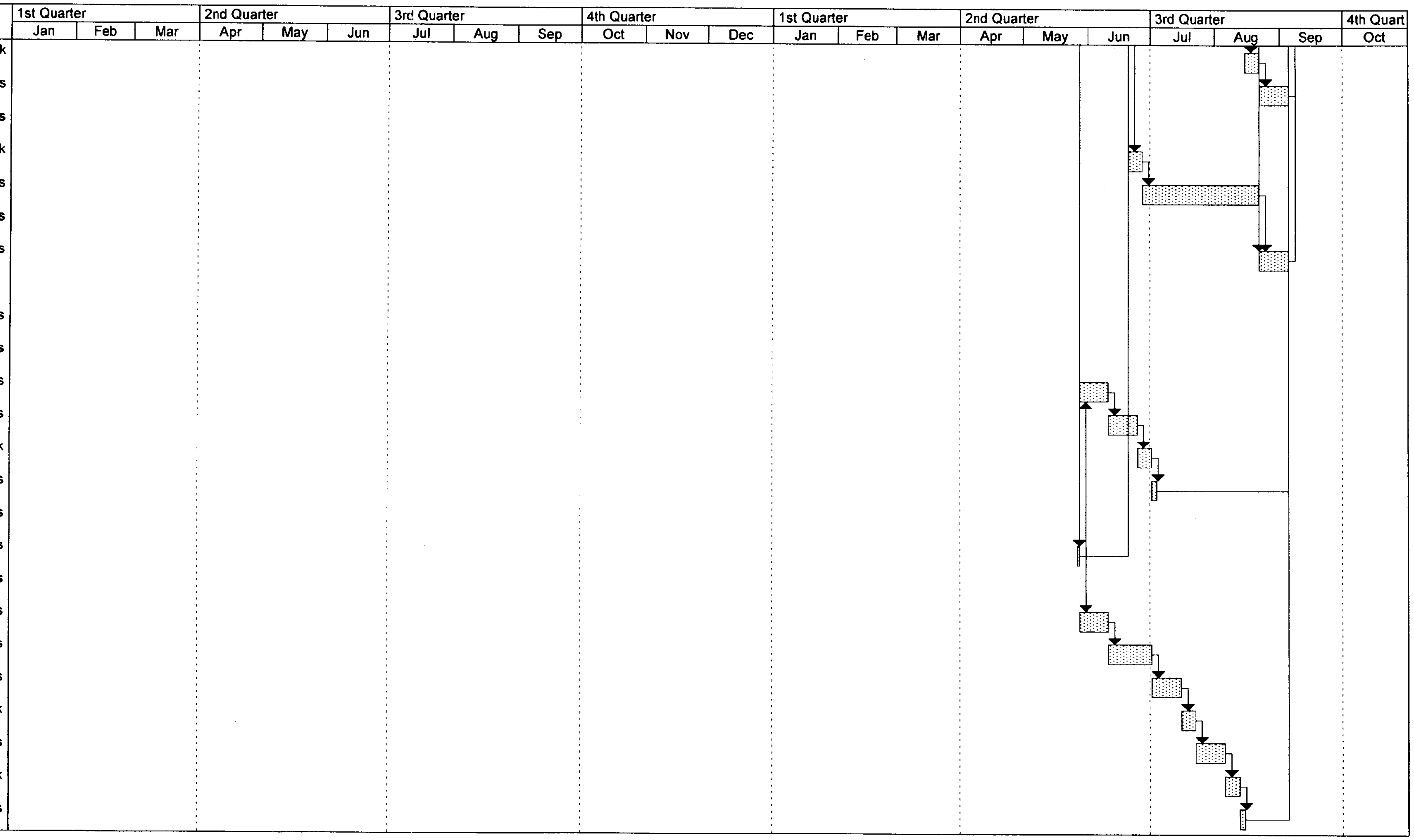
Construction Schedule for RCC Dam Project

ID	Task Name	Duration
35	Mob the first Season	4 wks
36	Demob the first Season	3 wks
37	Mob the Second Season	4 wks
38	Demob the Second Season	3 wks
39	**STORAGE &PONDING OF CONSTR WATER**	**17.7 wks**
40	Diversion Conduit Upper Dike	1 wk
41	Remove Diversion Upper Dike	1 wk
42	**DIVERSION AND CARE OF WATER**	**17.7 wks**
43	Diversion Conduit 48" Dia CMP	1 wk
44	Remove Diversion Upper Dike	1 wk
45	**SITE ACCESS & HAUL ROADS**	**0.5 wks**
46	Constr Road Grade Road Bed	0.5 wks
47	**FOUNDATION WORK**	**3.2 wks**
48	**EXCAVATION,UNCLASF**	**0.5 wks**
49	Excavation and Strip Foundation	0.5 wks
50	**EXPLORATORY DRILLING**	**0.5 wks**
51	Nx Exploratory Drilling	0.5 wks
52	**PRESURE TESTING NX HOLE**	**0.2 wks**
53	Presure Testing NX Hole	0.2 wks
54	**FOUNDATION CLEANUP**	**0.5 wks**
55	Foundation Cleanup	0.5 wks
56	**FOUND.TREAT.DRILL GROUT CURTAIN**	**1 wk**
57	Drill Foundation Grout Curtain	1 wk
58	**DENTAL CONCRETE**	**0.5 wks**
59	Dental Concrete	0.5 wks
60		
61	**ROLLER COMPACTED CONCRETE DAM**	**68.7 wks**
62	**RCC TEST PLACEMENT**	**2 wks**
63	RCC Concrete,1 Test Slab,5 Strip	1 wk
64	Remove RCC Conc.,1 Slab,5 Strip	1 wk
65	**RCC CONCRETE**	**65.7 wks**
66	RCC Conc,Crushing &Stockpile Mat	4 wks
67	RCC Conc, Placing RCC Mix	8 wks
68	**SPILLWAY TRAINING WALLS**	**3 wks**



Construction Schedule for RCC Dam Project

ID	Task Name	Duration
69	Spillway Tr.Wall,Conc Spill Wall	1 wk
70	Spillway Tr.Wall,Conc Basin Slab	2 wks
71	**VERT. FACING SYSTEM DAM**	**9 wks**
72	Vert.Facing System, Starter Slab	1 wk
73	Vert.Facing System	8 wks
74	**SPILLWAY CAP CONCRETE**	**2 wks**
75	Spillway Cap, Overflow Conc Wier	2 wks
76		
77	**OUTLET WORKS**	**11.7 wks**
78	**CONCRETE OUTLET&IMPACT BASIN STR**	**5.5 wks**
79	Concr.Impact Basin Slab	2 wks
80	Concr.Impact Basin Wall & Baffle	2 wks
81	Concr.Impact Basin Precast Slab	1 wk
82	Outlet Channel Rip Rap,20" Thick	0.5 wks
83	**OUTLET CONDUIT (48" DIA. PIPE)**	**0.2 wks**
84	Outlet Conduit (48" Dia. Pipe)	0.2 wks
85	**INTAKE STRUCTURE**	**11.5 wks**
86	Intake Tower Foundation Slab	2 wks
87	Intake Tower Walls	3 wks
88	Intake Tower Elevated Slab	2 wks
89	Slide Gate Controller Slab	1 wk
90	Intake Tower Trashracks	2 wks
91	24"x 24" Slide Gate & Controller	1 wk
92	12" Dia. Vent Pipe	0.5 wks



APPENDIX F

References

APPENDIX F

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